JULY Shemucal Chemical & METALLURGICAL ENGINEERING



WATER CORN'S IS RECOUNTS A CRITICAL ROOMER AT CURINCAL DISERVE AS A REGION AS THE ISSUE DOINTE OUT

A McGraw Hill Publication

Fifty Cents





18-inch standard weight Tube-Tutn welding tee and pipe laid out preparatory to assembly for hydrostatic pressure test.



Welder completing last bead in assembly. Fitting and pipe now form homogeneous, leakproof unit.



Assembly is hung in pit, massively lined with concrete. During test top grating is closed and held down by a barricade of sandbags.



Final result after hydrostatic pressure test. The straight pipe burst first, and the tee is undamaged.



Strength through Design in Tube-Turn welding fittings

The pipe burst first!

Take an 18-inch standard weight welding tee. Take three corresponding lengths of pipe. Weld tee and pipe together. Cap the ends. Lower the assembly into a pit. Then apply hydrostatic pressure—much more than the assembly is supposed to take!

Something has to give! According to the accepted beliefs it should be the tee. But not in the case of the test pictured here. The TuberTurn "barrel-shaped" tee was used—and the pipe burst, well before the tee was affected! Throughout numerous tests, this new type of tee has withstood at least 25 per cent more pressure than required by the formula given in ASA B16.9.

The superior strength of the tee was achieved without running up extra weight and cost, by carefully planned improvements in shape (based on the sphere, nature's



strongest form for internal pressure), and by a carefully engineered distribution of metal.

This is a typical example of strength through design in Tube-Turn welding fittings, and another good reason why leading piping engineers specify Tube-Turn equipped, welded piping.

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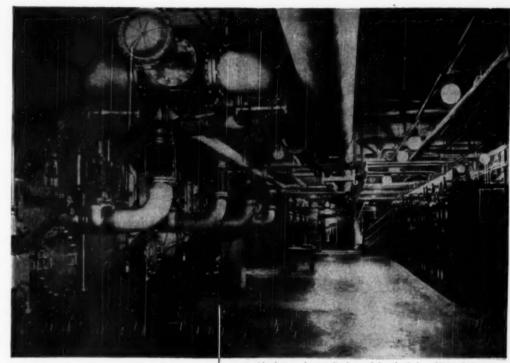
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APPLICATIONS & ADAPTATIONS

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For low concentrations of light
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xylene, tolures, gasoline, acrtone, toquene,



R2032 — (R32 Corbridge)
For low concentrations of acid
gases, funces and mists such as
sulphuric acid, hydrogen
chloride, nitric acid. Protects
against funce from plating and
pickling tanks, etc.



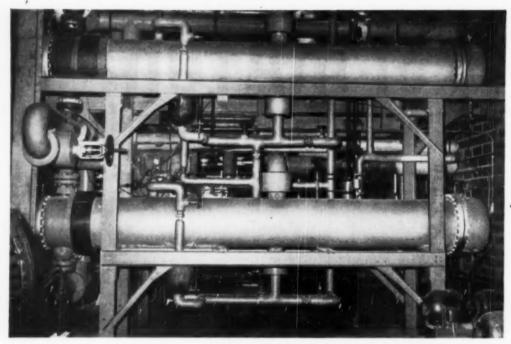
R2003 — (R33 Corridge)
For low concentrations of combined acid and organic gases such as halogenated hydrocarions and trehlorethylene, carion, and trehlorethylene, carion, protects against gases, fumes and vapors in degreasing operations, etc.



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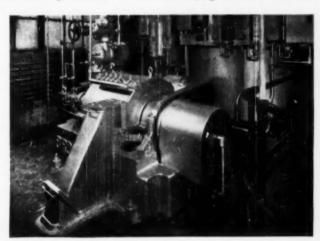


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In addition, Revere manufactures pipe and tube in copper and brass for general piping purposes, and electric welded steel tube.

Revere condenser plates can be had in a number of alloys in squares, rectangles, circles, half-circles, segments, and special patterns. These plates are flat, dense, free from blow holes or other imperfections, accurate in gauge, and are easily machinable.

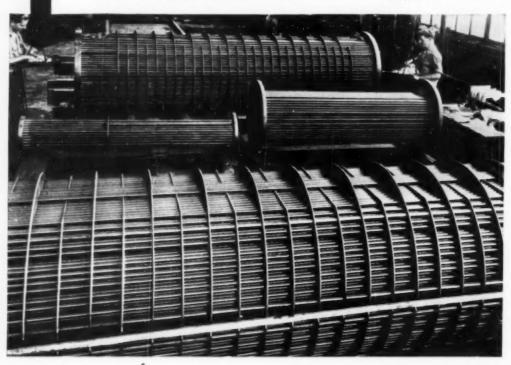
holes or other imperfections, accurate in gauge, and are easily machinable.

As each condenser, heat exchanger or other piece of equipment using tubes and plates presents an individual combination of conditions, no blanket recommendations are possible. Among the factors to be considered are chemical and impingement attack, velocities, pressures, temperatures, air entrainment, suspended solids. Should short tube life or other circumstances lead you to question your present practices, the Revere Technical Advisory Service will gladly cooperate with you in making thorough field and laboratory studies, to assist you to determine the most serviceable and economical alloys.

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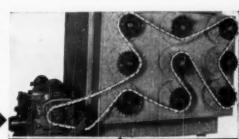
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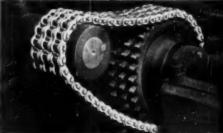
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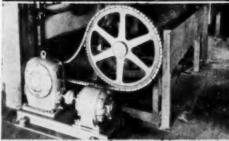
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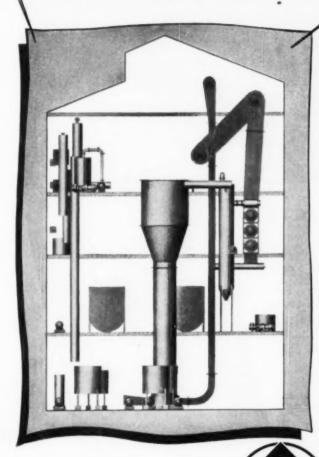


Bulletin 1386757 illustrates in detail the Allis-Chalmers system of continuous solvent extraction of vegetable oils. Information is shown on how typical AC installations can pay for themselves within a few years. Clip caupon at right and send it in for your copy of this handy, fact-filled bulletin.

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Field of Continuous Solvent Extraction

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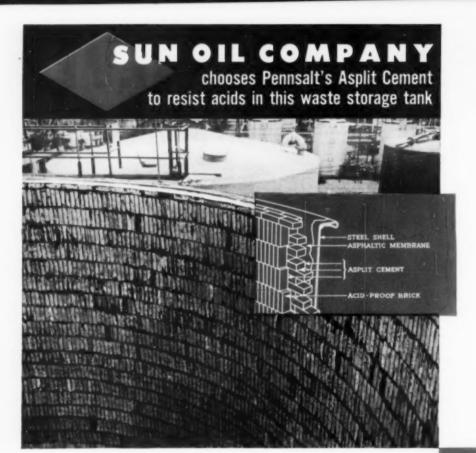
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For further details write us for illustrated technical folder. Special Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.





1770—Improvement of livestock by selective breeding boosted milk output . . encouraged dairy farming. City folk now began to sample this wonderful beverage. But harmful bacteria in milk caused sickness, spread disease.

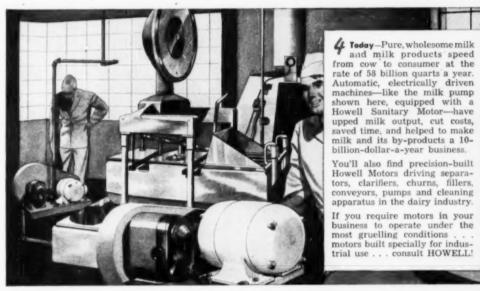


2 1864 - France's Louis Pasteur won world acclaim by discovering how to rid milk of impurities. Milk soon became an important source of food. Vitally needed was electrical horsepower to speed it from farm to consumer.



Motors arrived also marked the widespread use of the automatic rotary bottle filler and capper in the dairy industry. Soon, these rugged, industrial type motors were widely sought in many industries.

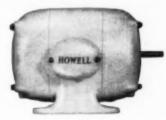
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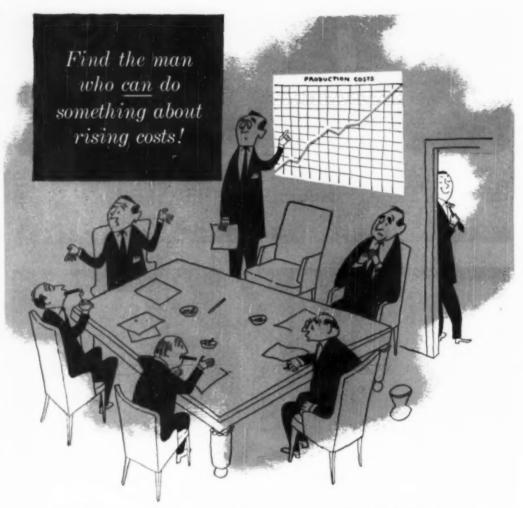


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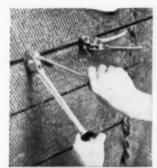
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FUEL SAVINGS AND

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These blankets satisfy the need for a convenient method of quickly and efficiently insulating flat or curved surfaces on larger types of heated equipment. Mineral wool is felted and secured between flexible metal fabric. Outstanding physical and chemical stability enable Eagle-Picher Blankets to resist water, steam, corrosive fumes and normal vibration.

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Eagle-Picher Supertemp Blocks are lightweight (approximately 16 lbs, per cu. ft.). Can be cut easily with knife or saw to fit off-shaped areas . . . they fit snugly over minor irregularities. They're strong and have high refractory value. Withstand temperatures up to 1700 F. Conductivity at 512 F. approximately 0.43....all standard sizes, from 3"x 18" to 12" x 38" . . . in thicknesses from 1" to 4".

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Since 1843

the end of horse and buggy days



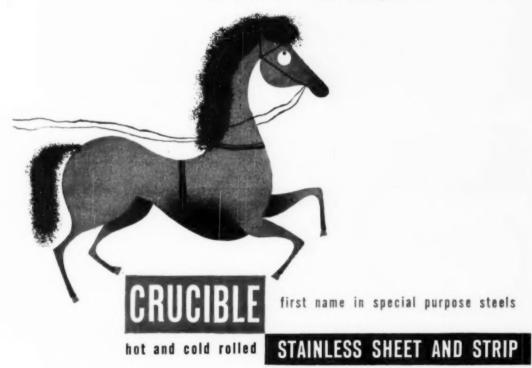
for stainless sheet and strip

Automobiles were once designed as horseless carriages—even to the dashboard socket for a needless whip. Stainless steel production, too, once struggled thru horse and buggy thinking. More power, heavier rolls, more care in surface finish—and stainless sheet and strip came forth a step-child of carbon steel methods. Today's modern strip mills have changed this, giving stainless production new concepts of quality.

CRUCIBLE, one of the pioneers in stainless steel, has gone still further. Now, for the first time, hot and cold rolled stainless steel is made a specialty product, by specialty production methods, in a mill built specifically for this purpose—in widths from ½" to 50" inclusive, and in all gauges, grades and finishes.

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CHEMICAL ENGINEERING-July 1949

21



The photo directly above shows on elevater where grain is unleaded, stored, cleaned and releaded with the help of numerous Kirk & Blum systems.

Kirk & Blum Dust Collection and Fume Control Systems are widely used in chemical, food, drug and allied fields. Here too, the "invisible" tool CLEAN AIR, has proved invaluable in efficient manufacturing and processing.

For example, two views in grain handling and milling are shown. In this industry, adequate dust collection is a must, since the dust presents both health and safety hazards besides contributing to general inefficiency.

Significant then, that many of the leading plants in this industry have selected and re-ordered Kirk & Blum systems. If you have a dust or fume problem, call on Kirk & Blum for efficient analysis and prompt, no-obligation recommendations. The Kirk & Blum Mfg. Co., 2908 Spring Grove Ave., Cincinnati 25, Ohio.

FOR CLEAN AIR . . . THE

TOOL

KIRKAND BLUMD
DUST AND FUME CONTROL SYSTEMS



THE little Armstrong No. 800 trap for pressures to 150 psi is the modern version of the Armstrong No. 100 trap which was introduced way back in 1931 as the first small, heavy duty, side-

inlet, side-outlet mechanical steam trap ever manufactured for small drips. The most widely used industrial steam trap in the world, it is also one of the most widely imitated, but only the Armstrong No. 800 offers all these advantages:

 Interior mechanism identical in material and workmanship to that in Armstrong traps for 1500 psi, 900° F.

- Actual tested bot condensate capacity from 450 to 690 lbs/hr continuous, depending on pressure.
- Free-floating, frictionless leverage system.
- Hardened chrome steel valve and seat.
- 18-8 stainless one piece deep drawn bucket.
- Only 5" x 51/8" overall; weight 41/2 lbs.
- Price only \$7.00 list.

The Armstrong No. 800 is unconditionally guaranteed to give complete satisfaction or your money will be refunded. Your local Armstrong representative carries these traps in stock and will give you prompt attention if you will call him today. Send for your copy of the 36-page Armstrong Steam Trap Book.

ARMSTRONG MACHINE WORKS, 858 Maple St., Three Rivers, Mich.



ARMSTRONG

STEAM TRAPS

For fuel savings, low maintenance, automatic air removal SPECIFY ARMSTRONG!

Will Your Product Meet Extremes of Humidity?



Investigate ATLAS SORBITOL!

Do you get complaints about your product when it has been stored in a damp, humid place? (Not necessarily as damp as the Davey Jones locker our artist has visualized . . . but maybe just ordinary "summer" humidities!)

If you make products like gaskets, paper specialties, adhesives, pharmaceuticals, confections, foods-you are fully aware of the way high humidities can play havoc-making some products swell, others become sticky or soggy, still others lose one or more desirable characteristics.

Sorbitol is a conditioner that especially fits this problem



because, compared with other polyols, it varies less in moisture content with changes in humidity! Moreover, it remains more viscous at high humidity, helping counteract softening action of excessive water.

Sorbitol is plentiful, and its price trend is downward. So check into its advantages now. Write for the Atlas sorbitol book, or consult the Atlas technical staff.

ATLAS CHEMMUNIOUÉ

New "Language" of Emulsifiers

The new Atlas HLB (hydrophilelipophile balance) system of choosing emulsifiers results in a telegraphic language between emulsion technologists. A letter addressed to Atlas may say, "We tried mixtures of Span* 40 and Tween* 40 for heavy mineral oil, at HLB's from 9 to 10.5. The HLB of 9.6 seemed best but there was 10% creaming after 24 hours." It might sound like double-talk, but enables Atlas to recommend the right emulsifier much more quickly.

Spray-on Cleaners

Atlas research has assisted in formulation of emulsion cleaners to be sprayed on such surfaces as machine parts, motors, airplanes or garage floors-easily and quickly washing away grease, oil or other soil. The cleaner is flushed away with water, draining smoothly and evenly without spotting. Such cleaners are made from suitable petroleum solvent, with 2% or less of Atlas emulsifier.

Emulsifiers Can Help Kill Bugs. Too!

Research studies show that s slightly increased amount of proper emulsifier, beyond the fractional percentage needed for emulsion stability, often steps up insect killing power of many toxicants as much as two or three times, by increasing wetting and penetrating power. Atlas research works with formulators on emulsifier selection.

*Reg. U. S. Pat. Off.





ATLAS POWDER COMPANY, Wilmington, Del. . Offices in principal cities . Cable Address-Atpowco In Canada address A F Sterme and Sons Brantford, Ontario

How to Tame a Tough Joint



K EEP an eye on the future when you install piping — even the most innocent looking connection can become a "rough joint" through leakage — pressure-loss — the focal point for erosion and corrosion — constant maintenance time and cost.

You can tame probable "tough joints" in piping by making connections with permanently tight, leakproof Globe Welding Fittings. Strength is forged in the fittings — flow friction and pressure-loss minimized by precision formed true angles, radii, circularity—weight and space requirements reduced—exact dimensional accuracy that

saves time, speeds piping assembly. To do any piping job better — use Globe Welding Fittings produced from Globe seamless steel tubes by the Globe Precision Process,

GLOBE STEEL TUBES Co., Milwaukee 4, Wis.

Producers of Globe seamless stainless steel tubes — Gloweld Welded stainless steel tubes — carbon — alloy — seamless steel tubes — Globeiron seamless high purity ingot iron tubes — Globe welding fittings.

For complete information on sizes and types send for Globe Welding Fittings Catalog.

GLOBE " WELDING FITTINGS

it DIGS...it LOADS at tremendous savings



Whether you need it for excavation work or loading from stockpiles or both, you need the new low production cost of the Dempster-Diggster. Here is the only small shovel that works on a hydraulic, simultaneous or independent crowd and hoist action and completely eliminates tractive effort in loading with wheels. Its variable crowd action at any dipper position means the Dempster-Diggster can dig lower . . . 15 inches below grade. Exclusive hoisting action means it can dig higher . . . digs out a 15 ft. bank. It's the only small shovel featuring such speed and mobility . . . travels at truck speeds on the road . . . gets in tight places on big jobs, freeing large shovels for heavier work. Ideal for the small and medium size excavation jobs yet powerful and fast enough for big jobs.

Stockpiling or loading work is easy for the DEMPSTER-DIGGSTER. Its speed . . . its 15 ft. turning radius . . . its extraordinary dumping reach help the Dempster-Diggster complete the average loading job in an amazingly short time. Dempster-Diggster buckets are easily interchangeable and are available in three sizes. I cu. yd. (heaped) with hardened steel teeth for digging . . 1½ and 2 cu. yd. for loading and stockpiling work. Power is supplied by a heavy duty gasoline or diesel engine. Hoisting, crowding, steering and braking are all 100% hydraulic. For complete information, write today for Folder Number 8154.



Large photo above shows Dempster-Diggster loading crushed stone. Note how independent crowd and hoist action permits bucket to follow the slope of the material. At right, top: Digging out high bank. Right, center: Closeup of I cu. yd. (heaped) digging bucket. Right, bottom: Dumping crushed stone into truck.

279 DEMPSTER BLDG., KNOXVILLE 17, TENNESSEE

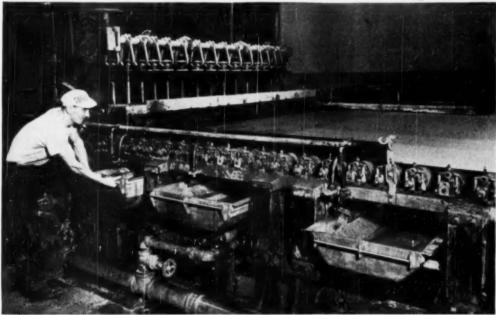




July 1949—CHEMICAL ENGINEERING

FIBRE RECLAMATION IN PAPER MILLS is a job being well done by ENDURO Stainless Steel. The water extracted from paper stock contains a high percentage of fibre. So that it may be returned to the paper machine system uncontaminated, it is collected in "Save-all Pans" of stainless steel. For practically every type of processing equipment, ENDURO is your assurance of no contamination.





NO CONTAMINATION . . . Thanks to STAINLESS STEEL!

Paper making is one industry where soilage is spoilage. Profits themselves depend on strict cleanliness throughout the process. Republic ENDURO Stainless Steel . . . the metal that comes clean and stays clean . . . takes the worry out of fibre reclamation, as it does out of many a like job.

ENDURO has a high strength-to-weight ratio, resists corrosion, has high heat-resistance, requires little or no maintenance and has exceptionally long life. In addition to the profits it turns back into the business by prevention of product contamination, it pays a profit in its

own right... through minimum maintenance cost, maximum on-the-job time and extended life. Its slightly higher initial cost quickly turns into profitable economy.

There are many analyses of ENDURO, each designed to meet the needs of specific applications. It will pay you to check with your equipment manufacturer or write to:

REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Obio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York



V Check ALL 10 Advantages: • RUST AND CORROSION-RESISTANCE • HEATRESISTANCE • HIGH STRENGTH • NO METALLIC CONTAMINATION • SANITARY SURFACES
• EASY TO CLEAN • EYE APPEAL • EASY TO FABRICATE • LONG LIFE • LOW END COST,



REPUBLIC

FIRST



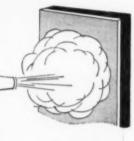
350° STEAM

THEN



60° WATER AT 1500 LBS.







Stainless-Clad Steel decoking tower of Cities Service Oil Company, East Chicago, Indiana, built by Chicago Bridge & Iron Company, Chicago, Ill.

"There has to be a bond to take that punishment"

A materials engineer for an oil refining company was telling why be insisted on a Lukens Clad Steel, with its permanent bond between cladding and backing plate, for their decoking tower.

"Even under those severe conditions, there will be no separation of the metals. We get protection of the equipment and our products from the clad surface, and the bond prevents corrosive materials from creeping in to attack the base metal." You get this permanence of bond and uniformity of cladding in all Lukens Clad Steels— Nickel-Clad, Stainless-Clad, Inconel-Clad and Monel-Clad. Thus you can obtain the benefits of these solid corrosion-resistant metals with the economies possible with clad steels.

Lukens makes clad steel plate as wide as 178 inches, or as thick as 6 inches—all in the extrasmooth sodium hydride finish. Applications in the Petroleum Industry are described in Bulletin 461. For a copy,

write Lukens Steel Company, 400 Lukens Bldg., Coatesville, Pennsylvania.





SOLID METAL ADVANTAGES WITH CLAD STEEL ECONOMY

. . SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL . .



New Texrope Sheave Gives Lowest Cost

Instant Speed Control

- Covers most speed changing needs from 3 to 20 hp
- Very simple one sheave does all
- Infinitely variable speed 100% increase; 2 to 1 range.

THE NEW Vari-Pitch AUTOMATIC SHEAVE is the simplest, most economical method of instant speed control ever devised. You just move the motor forward to increase speed and move the motor back to decrease. The Vari-Pitch

Automatic Sheave changes pitch diameter and holds the belts at proper tension automatically,

ALLIS-CHALMERS, 1147A SO. 70 ST.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

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by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS - 1/2 to 25,000 hp and up. All types.

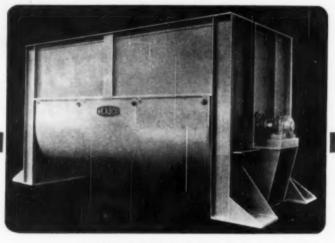
CONTROL — Manuel, magnetic and combination starters; push button stations and components for complete control systems.





PUMPS - Integral mater and coupled types. Sizes and ratings to 2500 GPM.

Read the Facts About READ Chemical Equipment



Read Heavy Duty Blenders are supplied in batch capacities of 1 to 500 cu. ft.

ITS SPRAY MANIFOLD

gives you complete incorporation

OUR BLENDERS for heavy-duty applications are virtually custom-built to fit your needs. They are the "last word" in blending for manufacturers of plastic, semiplastic, moist and dry materials.

READ Heavy Duty Blender Advantages:

- Equipped with Spray Manifold for admission of liquids during blending via a continuous spray (no drops)—complete incorporation of the liquid without formation of agglomerates.
- Close clearances between ribbon and shell avoid "build up" of material.
- Inner and outer ribbons accurately proportioned to avoid "pile up" of material at any point.
- Carbon steel, stainless steel or any commercial alloy blending compartment for long life. High-pressure or low-pressure jacket. Covers to suit installation.
- Agitator shaft is mounted in outboard antifriction bearings.
- Packing glands are independent of bearings.
- Standard design permits vertical removal of agitator from blender. Removable end type available.

BRING YOUR BLENDING PROBLEMS TO READ

CALL ON...

Write for literature on Read Heavy Duty Blenders . . . state your specifications and requirements READ

MAKERS OF READED CHEMICAL EQUIPMENT

MACHINERY DIVISION

of THE STANDARD STOKER COMPANY, INC.
YORK, PENNSYLVANIA

FOSTER WHEELER DOWTHERM HEATED PROCESS SYSTEMS

designed, fabricated and erected under one responsibility and with one overall guarantee

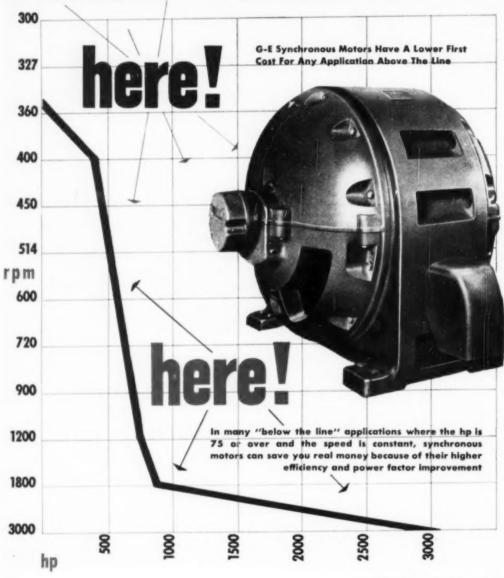
When making an installation of a Dowthern heated process system in year plant, it is essential that all heating equipment and interconnecting piping, as well as the Dowthern vaporizer, be properly designed and furnished by a manufacturer with sufficient background in this type of work to know the special problems involved. In 1932 Paster Wheeler Corporation, builders of heat exchangers and direct first boilers and heaters for the past 50 years, was the first manufacturer to design, engineer, and construct a complete Dowthern heated process system. Since that time, faster Wheeler has installed more if an 300 vapor generators and—in most case—has supplied and engineered the entire systems. Some of these installations include Dowthern vaporizers with capacities up to 35,000,000 bits.

POSTER WHEELER CORPORATION
165 Disselvery, New York & N. Y.

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CHEMICAL ENGINEERING-July 1949

SAVE MONEY!



GENERAL SYNCHRONOUS MOTORS

In their natural fields of application, synchronous motors have a lower first cost than any other kind of motor!

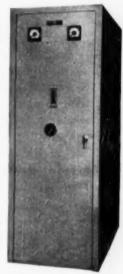
When you specify General Electric synchronous motors, you get unequalled application engineering by experts in the electrical problems of your industry. They make sure you get the right motor -the motor that will give you the greatest return on your investment.

For your next large, constant speed motor, ask your General Electric sales representative for the full story, and how you can take full advantage of the money saving features of G-E synchronous motors.

GET THE MOST FROM YOUR MOTOR WITH G-E CONTROL

New rater field circuit prolongs life of your motor and equipment. Offers: precise synchronization (within half a cycle); constant protection without "babying" the motor; automatic and instant field removal at slip cycle.

This factory assembled and tested unit is your assurance of accurate motor performance regardless of type of G-E synchronous motor control you require full-voltage magnetic, reduced-voltage magnetic, or reduced-voltage semi-magnetic. Standard, heavy duty components are panel mounted, enclosed in a compact, steel cabinet. Short-circuit protection with air-circuit breakers or highvoltage fuses is available. All parts easily accessible, little maintenance required, adjustments easy.



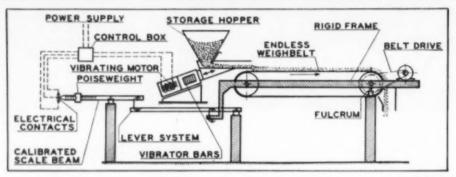
This is the quality control your synchronous motor needs for really efficient operation. It is specially engineered and built for years of service for your application. Write for the bulletin in the coupon.

Gentlement I would like more infermation on whiched descriptive literature.	Apparatus Dept., Sec. C770.4, G	eneral Electric Company ad, Schenactady S, N. Y. stors. Please send me the
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GENERAL (%) ELECTRIC

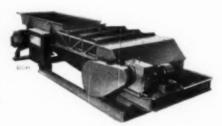


CONTINUOUS GRAVIMETRIC FEEDING ACCURATE



(PATENTED)

For accurate weighing, feeding, batching and proportioning there is this Jeffrey-Traylor WAYTROL—a precision machine with rate of delivery automatically regulated. Control is electrical and instantaneous. Compensating for error, the WAYTROL provides a system of continuous weighing, following exactly the theory of precision of measurement upon which it is based. Let us tell you more about this unit with the "Electric Brain."



TYPE 450 WAYTROL

Partial List of Materials being fed by WAYTROLS

Activated Carbon	Cool	Iron Borings	Sand
Alum	Coke	Iron Ore	Shale
Ammonium	Explosives	Limestone	Sada Ash
Sulphote	Feldspar	(crushed)	Storch
Bauxite	Fluorspor	Limestone	Total
Borax	Food Products	(pulverized)	Tebacce
Coment Clinker	Fullers Earth	Pebble Lime	Wood Chips
Cement (finished)	Gypsum	Plastics	Wood Flour
Chemicals	Glass Cullet	Petash	Zinc Ore
Clay	Hydroted Line	Soft Cake	

SIZES AND CAPACITIES

Type		r hour (based on anular Material)			
700	Minimum	Maximum	HP	lbs.	
116	60 lbs.	6,000 lbs.	1/16	1,050	
220 AC	300 lbs.	15.000 lbs	36	1,800	
220 MC	300 lbs.	30,000 lbs.	1/2	1,900	
330	1000 lbs.	100,000 lbs	1	3,800	
450	2000 lbs.	200,000 lbs.	1	6,000	
5080	5000 lbs.	500,000 lbs	2	12,000	

ELECTRIC VIBRATING

Feeders Coolers Conveyors Packers Bin Valves Screens Dryers Waytrols Bin-Level Controls

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MANUFACTURING COMPANY Established 1877
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For Jeffrey-Traylor Equipment in Great Britain: - Lockers (Engineers) Inc., Warrington, England.

U.S.I. CHEMICAL NEWS

uly A Monthly Series for Chemists and Executives of the Solvents and Chemical

1949

Versatile Pyrenones Give Unusually Wide Range of Pest Control

Highly Effective In

Many Important Fields

From restaurant kitchess to huge grain warehouses, many of the most important and varied types of pest coatrol problems are now being solved by U.S.I.'s Pyrenones. Combining unusual safety and effectiveness against a wide range of insects, their use is extending to many vital areas of pest control.

Proven inherently non-toxic to warmblooded animals in three years of exacting tests, Pyrenones can be used safely on crops while they are growing, in warehouses where food is stored, in plants where food is processed, and in restaurants or homes where food is prepared for eating.

Protect Stored Grain and Grain Products

Pyrenone-type insecticides offer safe, longlasting control of such grain insects as confused flour beetles, cadelles, grain borers, moths, and the yellow meal worm. For this reason, Pyrenones are highly effective in protection of stored grain or grain products in mills and warehouses, in shipe' holds, in grain clevators, in grain box cars, and in interiors of farmers' gvain bins.

Valuable Where Food Is Processed Or Prepared

In the important food processing industry, Pyrenone's combination of safety and effectiveness is particularly welcome. Insecticides containing Pyrenones quickly kill the

New Flat Plastics Lens Is Revolutionary Advance

A new, thin, flat plastics lens, described as revolutionary in the optical field, reportedly weighs only about one-tenth as much as a glass lens. It is cheaper to produce, and yet will magnify, focus, and in other respects perform just like a conventional glass lens, the makers assert. The new-type lens is said to derive its magnifying power from the fact that its apparently flat surface is molded into a series of small concentric grooves which refract light in the same way as does the unbroken curve of a glass or oil-filled plastic

The lightness of the flat plastics lenses permits field lenses of very large area, and their thinness almost eliminates spherical aberration, according to the manufacturers. While not precise enough for the picture-taking lens of a camera, the new-type lens is expected to find wide use as a television magnifier, a production-line inspection lens, a slide-viewer lens, etc.

Makes Paper from Straw

Paper can now be made from almost any kind of straw, it is claimed, using a new chemical process. The individual straw fibers are reportedly broken apart without reducing their length.

17-Mile Channel Turns Land-Locked Harbor Into Excellent Port

Distribution Center for Hydrocarbon Synthesis Chemicals Will Have Access to Fine Facilities for Shipping by Water or Rail

Located at the Port of Brownsville, Texas — the youngest of all ports of major importance — U.S.L's new distribution center for hydrocarbon synthesis chemicals will have available the latest in docking, cargo-handling, and other shipping facilities. The port is an artificial harbor which has been connected

Low-Octane Motor Fuels Fortified with Alcohol Equal Regular Gasoline

A truck fueled in recent tests with 58octane gasoline plus periodic injections of alcohol and water is said to have operated as well as it would on regular gasoline having an octane rating of 74 or better.

weit as it woint on regular gasonine naving an octane rating of 75 or better.

Researchers reveal that during at least 80 per cent of normal driving, when a car is running on the level at speeds up to about 40 miles per hour, the engine will run satisfactorily on gasoline of 50-octane number or even lower. For this reason, much of the anti-knock quality of ordinary gasoline - 74-octane or better — is in effect wasted. On the other hand, during acceleration, hill-climbing, and in general whenever the engine is working hard, a relatively high-octane fuel is required. Injection then of alcohol-water mixture into the carburetor can provide the needed anti-knock quality, increasing the effective octane number of gasolines by as much as 20 octane units, it is claimed.

with the Gulf of Mexico by a 17-mile, straight and unobstructed sea-level channel. The port's facilities include up-to-date docks, the latest in fireproof general cargo wharves, and modern freight and cargo handling machinery.

in meproof general cargo wharves, and modern freight and cargo handling machinery. Construction of the hydrocarbon synthesis plant of Carthage Hydrocol, Inc., the chemical separation and refining plant of Stanolind Oil and Gas Company, and U.S.I.'s chemical storage, compounding and distribution center, is progressing rapidly and should be completed by the end of 1949. U.S.I. will distribute to industry or to its ewn plants all of the water-soluble oxygenated co-products of the hydrocarbon synthesis process.

New Docks Being Built

In addition to the fine docking facilities already existing at the port, a new 500-foot oil dock is being constructed for Carthage Hydrocol, and adjoining this, special docking facilities for the U.S.I. distribution center will be installed. The fact that transport by rail, barge, or cargo ship is so readily accessible to U.S.I.'s new Brownsville establishment helps assure U.S.I. customers of a dependable and continuous supply of the important alcohols, aldehydes, ketones, and acids to come from the hydrocarbon synthesis.



Air view of Port of Brownsville, showing the harbor in the fereground and looking east along the 17-mile sec-level ship channel that connects it with the Gulf of Mexico. In the background, just to the left of the point where the harbor narrows into the channel, can be seen the site and the partly completed structures of the plants of Carthoge Hydrocol, Stanolind, and U.S.I.

U.S.I. CHEMICAL NEWS

1949

New Fatty Acid Separation Develops New Rocket Fuel

Fatty acids can be separated from soybean, corn, and other vegetable and animal oils fractional crystallization from acetone, followed by continuous vacuum filtration, a recent patent states. Chilling of the acetone solution causes formation of a two-phase mixture, according to the patent, with the fatty acids to be separated in the solid phase. Then, in a continuous cycle, filtration, washing, and drying are carried out in a vacuum-drum filter, and separation of unsaturates from saturates is claimed to be practically complete. Further separation of stearic from palmitic acid is also said to be possible.

Bone Cancer Is Treated With Radioactive Gallium

Bone cancer can now be attacked directly, a Navy medical man reports, by a radioactive isotope known as gallium-72. The gallium isotope has been tested on mice and dogs, and was recently approved for use on selected

CONTINUED

Versatile Pyrenones

chocolate moth, cheese mites and skippers,

chocotate morn, cheese mites and suppers, fruit flies, silver fish, and cockroaches – yet they create no toxicological hazards. Similarly, in the home and in restaurants where food is prepared for human consumption, Pyrenones give safe control of these in-sects, as well as other, common insects like houseflies, fruit flies, gnats, mosquitoes, ants, spiders, and bedbugs.

Controls Insects Attacking Dairy Cows, Range Cattle

Dairymen and cattle ranchers are getting outstanding insect control using a variety of Pyrenone-based formulations - water emulsions, oil-type sprays, dips, dusts, or wettable powders. Treated cows are healthier and give more milk; treated range cattle show sizeable weight gains, and there is no danger of contamination of meat or milk products by the insecticide.

Using Liquid Hydrogen

Using liquid hydrogen cooled to -423°F, researchers have developed a new rocket fuel that generates an exhaust which travels at a speed of 15.000 miles per hour, it is claimed. The university laboratory which developed the fuel has built a motor the size of a man's hand to burn the fuel, it is reported.

Sulfa Drug Damage Is Minimized by Methionine

The sulfur amino acid methionine pre-vents damage to the thyroid in rats caused by prolonged sulfadiazine intoxication, according to a report made recently in a medical publication, Bt. Methionine is now being produced in quantity by U.S.I. to meet the increased demands of the pharmaceutical and feed industries.

Domestic Coal Can Supply High-Grade Montan Wax

Domestic coal sources could be exploited to supply large quantities of high-grade montan wax, recent investigations have shown. Montan wax was formerly imported from Germany, for use in carbon paper, insulation, and many other products.

Subject Index of Reports On European Technology

A new subject index and abstract collection of over a thousand unclassified scientific and technical reports, prepared by a special committee and dealing with European technology, is available now.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.J.

For laboratory testing of paints, inks, chemicals etc., a small mill, said to arind, embality, homo-qenize, mix, and disperse these materials is now available. Adjustment for different grind sizes can be made without stopping and long runs are possible, the makers state. (No. 489)

A new adhesive tape for heavy packaging, said to be waterproof, and to have a tensile strength of 180-lbs, per inch of width, and a tear resistance of greater than 1600 gram-centimeters, is reported available. (50. 479)

Rust-proofing of fine instruments and other metal articles without greening or air-tight scaling is possible now, it is claimed, simply by wrapping them loosely in chemically treated paper. (%.471)

A flexible pelyethylene pour speut for paint pails is said to be available now as an integral part of a new-type closure described as tamper, vapor-rust, and leak-proof. [No. 472]

Carbonated beverages in any el six flavors can now be served, it is claimed, by dropping new, flavored tablets into a glass of water. Tablets eliminate handling of bottles and are and to take little storage apace. (No. 473)

A new plastic electrical tupe has α dielectric strength of over 10,000 volts plus the other electric characteristics of its parent material, polyethylene, the makers state. It is reported to be 10 times more mointwer-evaluation than vinyl types. (No. 474)

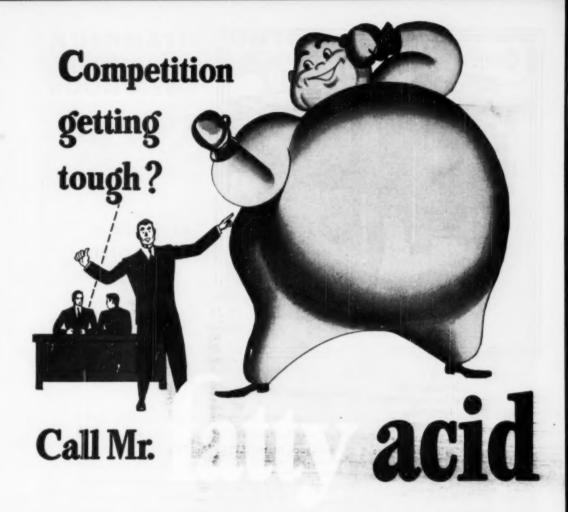
A high-flesh-point, non-injurious selvent for re-moving point, wox, grease, lube oils, or extreme pressure lubricants from skin, wood or metal surfaces is non-corrective, according to the manu-

Aluminum scraws, machine holts, weshers, nuts and nails are reported available now. The fasteners are claimed to resist rust when used with wood or aluminum construction, indoors

For applying protective coating films of uniform thickness on plane surfaces, a new compact, direct reading laboratory device is said to be accurate and easy to manipulate, and to have adjustable clearance. (No. 477)

To cisca and repollsh fisors in one operation a new non-slip floor pollsh has been specially formulated for wood floors, but a disc effective for hinoleum, linetile, cork, and similar resilient floors, the manufacturers assert. (No. 478)

5. INDUSTRIAL CHEMICALS. (U.S.I.) 60 EAST 42ND ST.; NEW YORK 17, N. Y. BRANCHES IN ALL PRINCIPAL CITIES ALCOHOLS ACETIC ESTERS RESINS (Synthetic and Natural) Ricci Alcohol . Butanal (Normal Butyl Alcohol) Fusel Oil—Refined *Arostar — sikyds and allied materials *Arotene—bure phenolics *Arothen — modified types Ester Gums—all types Congo Gums—raw, fused & esterified Natural Resins—all standard grades Acetoacet-artho-chloroanilide Acetoacet-artho-taluidide Ethanal (Ethyl Alcahol) ORALIC ESTERS Acetoacet-para-chlorognilide and anhydrous formulas Completely Denatured—all regular Ethyl Acetoacetate Ethyl Benzoylacetate Diethyl Oxolote INSECTICIDE MATERIALS PHTHALIC ESTERS ETHERS Ethyl Ether, U.S.P. Ethyl Ether Absolute - A.C.S. Dibutyl Phthalate Diethyl Phthalate ANTI-FREEZES FEED PRODUCTS Ribaffavin Concentrates *Vacatione *Curbay 8-G *Special Liquid Curbay jos. Methignine INSECTIFUGE MATERIALS *Super Pyro Anti-freeze U.S.1. Permonent Anti-freeze OTHER ESTERS Triple-Mix Repellents Diethyl Corbonate OTHER PRODUCTS ACETONE Chemically Fure rocellulose Solutions *Registered Trade Mark



A lot of people have been getting pushed around, recently . by Chemistry. Products with remarkable new properties, and new production economies, have enabled some manufacturers to pummel their competitors unmercifully. If you face such a situation today, you should certainly renew your acquaintance with our old friend Mr. Fatty Acid.

Here at Archer-Daniels-Midland Company, we have been manufacturing fatty acids for many years. Our facilities-for research, product control, distribution, and field service-are complete, modern and efficient. So we can say with great assurance . . . if competition is getting tough, the stoutest friend you can have on your side is our own Mr. Fatty Acid.

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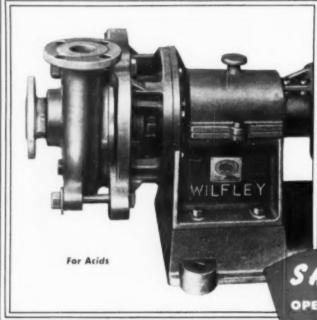
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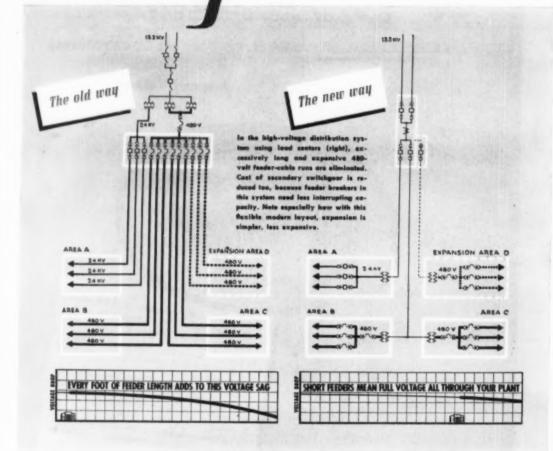
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What's the trend in chemical plant electrification?

more high-



Here's what you need to modernize your power system!

WHEN YOU COME TO GENERAL ELECTRIC you get far more than the finest in electrical equipment. A General Electric application engineer, femilier with chemical plant practice, is at your disposal. If desired, he stands ready to take over the job of co-ordinating all the needed components, angineering your power distribution into ane modern, efficient system.

voltage distribution

to reduce power losses, cut equipment costs

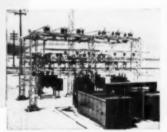
You see it in more and more chemical plants today. It's the trend to load-center power distribution. High-voltage power is distributed within the plant right to the heart of electrical load areas. There it's stepped down to utilization levels in load-center unit substations and carried to points of use by *short* low-voltage secondary feeders.

This modern method provides several advantages. By replacing long, lowvoltage feeders with short ones, voltage fluctuation is kept within narrow limits, and voltage drop is lessened. This cuts power losses, permits plant equipment to run at full efficiency.

Economies in the cost of cable runs, as well as in the cost of transformers and secondary switchgear, go hand in hand with high-voltage distribution. Plant rearrangements or additions can be made at less cost because of the flexibility of this system. Lower maintenance costs and easier installation are added advantages.



THREE KINDS OF HELP . . . NO OBLIGATION! It's a simple matter for you to get the whole story on how modern chemical plant power distribution can affect your plant layout, operating continuity, costs. As a service to industry, General Electric offers a 3-point program comprising (1) A fact-filled manual, without sales talk, on plant power distribution; (2) A slidefilm with sound that shows in detail what load-center distribution is and what it does; (3) Illustrated booklets highlighting the main points of manual and film. Write today to have this helpful program made available to you and your staff—without charge or obligation. Apparatus Depti, General Electric Company, Schenectaly, S. N. Y.



These completely metal-enclosed G-E package substations are factory-built to fully coordinated designs. You save both engineering time and installation time.

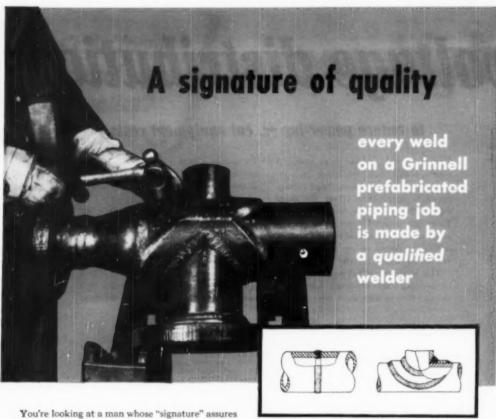


In G-E metal-clad switchgear, convenient vertical-lift construction of magne-blast air circuit breakers makes it a quick, easy job to remove them for inspection or maintenance.



Lead-center unit substations compact, fully enclosed, and built from matched components are complete, easy-to-specify units. Made in flexible combinations, they're easy to move and resurrance.

GENERAL E ELECTRIC



You're looking at a man whose "signature" assures quality welding of piping. He's a Grinnell welder and, as every Grinnell welder, he is qualified by Grinnell according to a procedure which conforms to A.S.M.E. Boiler Construction Code, Section 9. After qualifying, he is given a number which he "signs" adjacent to each weld he makes.

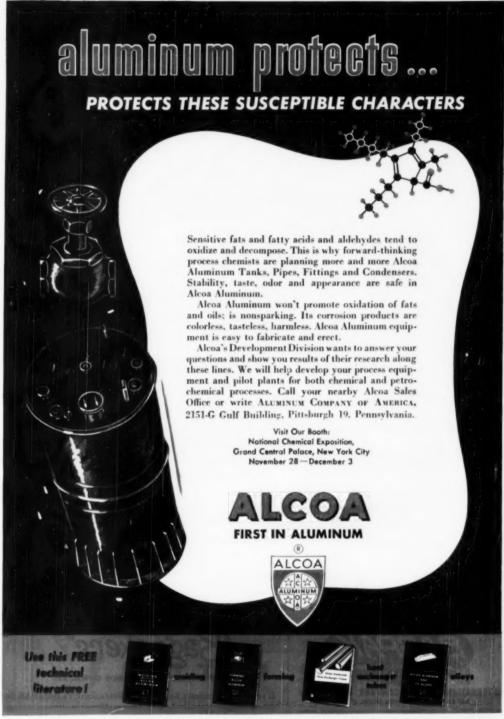
Quality welding is only one of a long chain of responsibilities assumed by Grinnell on every prefabricated piping job . . . from the interpretive engineering to the on-time delivery of the fabricated piping. Such responsibility requires facilities for metallurgical research and testing, comprehensive knowledge of state laws and industry codes, and a complete familiarity with insurance company requirements for fabricated piping.

The fabrication of piping for today's high pressure, high temperature or corrosive services is a job for experts. It's a job for Grinnell prefabricating plants because Grinnell has the modern equipment and methods, and the skilled personnel which enable them to assume total responsibility for the job.



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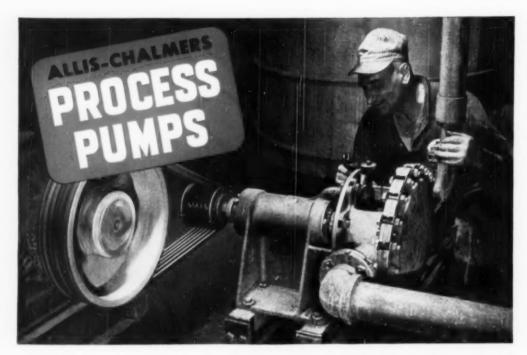
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A LARGE MIDWESTERN PROCESSOR used conventional pumps to handle acidulous liquor with highly abrasive carbon. Maintenance was high; breakdowns frequent. When A-C process pump took this tough job, maintenance dropped over \$1,000.00 a year.

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A-C process pumps give you added life and much lower maintenance costs because (1) the unique hydraulic design greatly reduces stresses on rotating parts, (2)

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Shipment from stock on complete pumps and all parts in aluminum-bronze, Niresist, 18% chrome steel and 316 stainless steel. See your A-C Dealer or Sales Office or write for bulletin 08B6615.

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TEXROPE — Belts In all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

0%-50% lower crushing cost

with Williams "Super-Slugger" Crusher

BECAUSE POWER SHOVEL LOADED STONE IS CRUSHED TO 11/2 INCH OR 3/4 INCH ... IN ONE OPERATION!

Here's the extra heavy duty hammermill that spells that welcome word economy. Built by Williams, the pioneer of the idea of crushing limestone, shale, glass, bauxite, phosphate rock, ashestos rock and other chemical and fibrous materials to small sizes in one operation, the new Super-Slugger represents the latest improvements and the accumulated experience of many years in building heavyduty hammermills. Savings result not only in initial investment... cost of foundations, conveyors, drives and buildings, but in faster operation and lower power consumption. If you require high tonnage output and a ma-

chine that can "take it" your investment in the Super-Slugger will pay off in more "payload"... and more profit! Write for Bulletin 634 for detailed information of the newest Williams Super-Slugger.

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Heavy-duty hammermills in smaller sizes; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screen; steel bins; complete 'packaged" crushing and grinding plants.

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BWH WIRE BRAID STEAM HOSE CAN REALLY "TAKE IT"

HERE'S PROOF!

Tests in the field show our new Concord #10 Steam Hose is a star performer. It doesn't get stiff and brittle, as some hose does when saturated with scalding steam. It's easy to handle. It's next to scuff-proof, even when banged against machinery and yanked over rough surfaces. But somebody raised another question.

"What happens," they asked, "if this wire-braid hose should be accidentally run over by a truck?"

To answer that question, we deliberately ran a 30-ton truck over our new Concord #10. What did happen? Nothing! The hose kept right on with its trouble-free performance.

Naturally we don't recommend such treatment. But we do say it's compelling proof that our Concord #10 is the last word in sturdiness. Here's what makes this hose outstanding:

- Same dependably strong, heat and oil resistant tube that has won fame for extra service in BULL DOG Steam Hose.
- Braids of high-tensile steel wire, heat and pressure resistant.
- Asbestos braid assures perfect cover adhesion, includes NEW type static-conducting wire.

 Tough cover, specially designed to resist abrasion and high temperatures.

With these features, it's easy to see why the new Concord #10 meets every need for steam hose that withstands 200 lb. working pressure with SAFETY, does a real job in helping you cut maintenance costs.

* * *

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Bring us your toughest problems. We're specialists in solving them. Consult your nearest BWH distributor or write to us direct.

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How to INCREASE BOILER RATINGS

with your present furnace and stack

Coppus - Dennis FANMIX Burners Give You More Heat with No Other Major Change in Equipment

Coppus-Dennis FANMIX Burners give you perfect mechanical mixing of fuel and air at the burner outlet . . . instantaneous ignition close to the burner . . . and complete combustion without visible flame when burning natural gas. No other burner combines these three advantages.

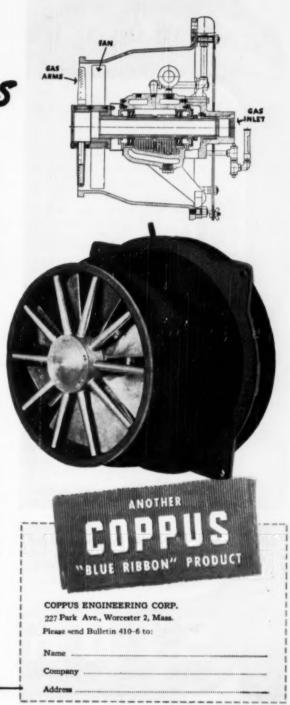
Because FANMIX delivers the right mixture of fuel and air without blow-torch action, all of your furnace space is used for combustion . . . none for mixing. That's why your present furnace can release more heat . . . why new installations can get more heat out of smaller furnace space.

Because FANMIX can be guaranteed to secure complete combustion of natural gas with less than 5% excess air, you get uniform "radiant heat" without drifting hot spots. That's why a FANMIX-fired furnace seldom varies in temperature more than 5% over its entire area.

WRITE FOR ALL THE FACTS

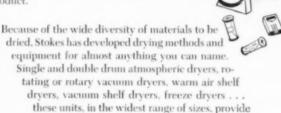
When you see in Bulletin 410-6 how fuel escaping from orifices in rotating driver arms rotates the fan to draw the correct proportion of air into the path of the fuel at right angles . . how FANMIX creates its own forced draft, reduces stack requirements, prevents cracking of "wet" gas . . how two FANMIX types handle either gas or oil or any combination of both — you'll understand why FANMIX Burners have such wide acceptance in oil refineries and power plants.

Send for the Coppus-Dennis FANMIX Bulletin 410-6. Coppus Engineering Corporation, Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG, and REFINERY CATALOG.



ASK If Drying is the Question

"How best to dry it?" is one of the most frequent questions in chemical processing. Its successful answer may make the difference between a profit and a loss . . . the difference between a fairly good and an excellent end-product.



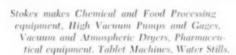
the capacities and economies you require.

And the Stokes semi-plant-scale laboratory will test-dry samples for you so the results may be checked before you invest.

Stokes experienced process engineers are ready to work with you on your drying problems.

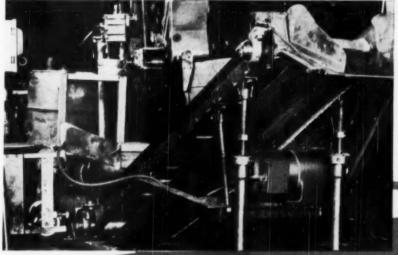








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Century 1/4 horsepower squirrel cage, gear motor driving a conveyor.

Requirements of Your Conveyors With

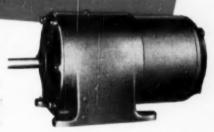
Century GEAR MOTORS

The conveyor shown here is driven by a Century Gear Motor which provides the correct power and speed to handle the output of a punch press.

Century Gear Motors are available in sizes from 1/6 to $1^{1}/_{2}$ horsepower to provide many combinations of power and speed. The right combination on your materials handling equipment will help to coordinate your production, reduce handling costs and increase efficiency.

Century Gear Motors are engineered to maintain the high torque slow speed shaft in rigid alignment. Mounting feet are an integral part of the rugged, compact gear housing—providing a strong rigid unit.

Specify Century Gear Motors for all your slow speed requirements.



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★ ALCOA Activated Alumina is an efficient desiccant over a wide range of operating conditions.

★ The simplicity of the process substantially reduces the supervision required.

* Equipment is simple . . . No intermediate supporting bed structures are required . . . Maintenance is low.

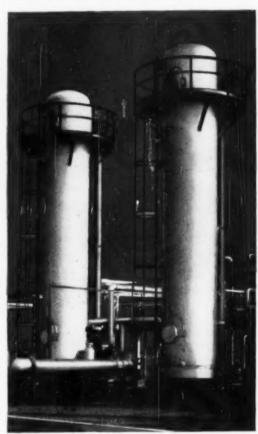
★ ALCOA Activated Alumina is produced by a chemically controlled process, resulting in a product of uniform chemical composition and physical properties.

* ALCOA Activated Alumina packs uniformly ... Does not swell, soften or disintegrate, even when immersed in water.

* Successive cycles of adsorption and reactivation may be repeated an almost unlimited number of times with no appreciable effect on efficiency.

Each of the two towers illustrated is charged with 24,000 lbs. of Alcoa Activated Alumina—enough to dehydrate 50,000,000 cu. ft. per day on a 12-hour cycle. The gas, containing approximately 42 lbs. of water per million cubic feet, enters the dehydrators at 85° F. and is dried to 31° F. dew point at 800 p.s.i. Natural gas, heated to 380° F. is used for reactivation.

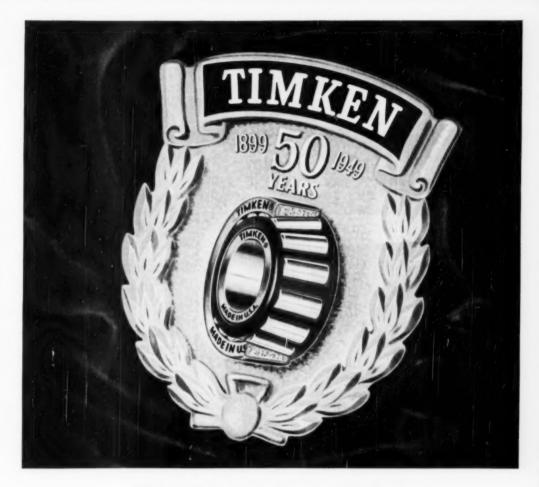
Whether you are drying gas to 31° F. at 800 p.s.i. or to minus 100° F. at 3500 p.s.i. you can obtain the desired dryness and maintain it continuously with Alcoa Activated Alumina. Let us tell you more about this efficient, reliable desiccant. We'll gladly furnish you with working samples. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 1778 Gulf Building, Pittsburgh 19, Pennsylvania.



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Registered as a trade-mark in the United States Patent Office, "TIMKEN" identifies products made by The Timken Roller Bearing Company: Timken tapered roller bearings, Timken alloy steels and seamless tubing and Timken removable rock bits.

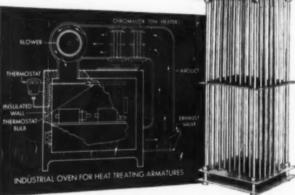
Experience over the years has shown Timken products to be the finest in their respective fields. And many thousands of men and women are working hard to keep them that way. No wonder it has become a habit throughout industry to look for the trade-mark "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

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1000°F.



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Here is unfluctuating, trouble-free electric heat for core-drying, heat-treating and annealing ovens, re-circulating air ducts and similar applications.

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CHROMALOX

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Electric Ovens Cut Core Losses and Reduce Baking Time by 70%

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Electrically Heated Plating Platens Cut Costs and Increase Production

Although Chomalon Electric Heaters were installed primarily to provide accurate operating temperature of the provide accurate operating temperature of the provide accurate one of the provide of the provided of the provided

If you use heat in your plant, send for this valuable booklet



"A to Z with Electric Heat

Its more than 50 photographs will show you many time and money saving ways to use electric heat. Write today, no obligation.

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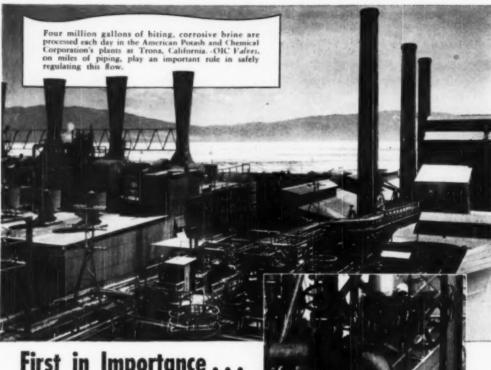
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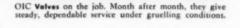
Like American Potash, you'll find that OIC makes a valve to fill your specific requirements.

If you'd like to discuss your valve problems with valve experts, see your OIC Distributor, or write direct to OIC.



SAY GOODBYE TO YOUR CHANGE-OVER PROBLEMS!

Changing over is easy with OIC's handy Cross Reference Chart. Simply check the number of the valve on your lines, look in the chart, and you'll find the number of the right OIC Valve for the job. For your free copy, write to The Ohio Injector Company, Wadsworth, Ohio. 640-18





STEEL • IRON • BRONZE

A X

"VALVE MEN" LIKE R-P&C VALVES

Men who really know valves—
know where to look for
those details of design and
construction that insure top
performance—have a lot of
respect for Reading-Pratt
Cady.

An R-P & C valve must be more than just an assembly of machined parts. It has work to do. R-P & C feels the responsibility for that work being done faithfully.

Censider yeer R-P & C distributor

as your "valve man"—a

responsible source for

bronze, iron and steel gate,
globe, angle and check

valves—Bar Stock valves—

iron cocks—Lubrotite gate

valves—cast steel fittings.

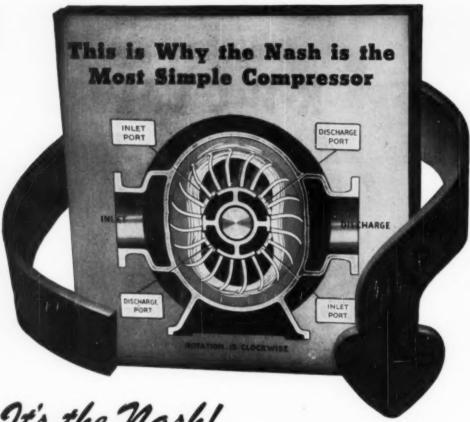
READING-

PRATT & CADY

ACCO Rending. Pa. e Attanta e Baltimare e Baston e Chicago e Denver e Detroit e Houston New York e Philadelphia e Pittsburgh e San Francisco e Bridgeport, Conn.



READING-PRATT & CADY DIVISION
AMERICAN CHAIN & CABLE



It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage. with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request.

No internal wearing parts. No valves, pistons, or vanes. No internal lubrication. Low maintenance cost. Saves floor space. Desired delivery temperature automatically maintained. Slugs of liquid entering pump will do no harm. 75 pounds in a single stage.

NASH ENGINEERING COMPANY
325 WILSON, SO. NORWALK, CONN.



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Whenever needed... wherever wanted, General Chemical products are always readily available to meet your process requirements. That is because General's broad network of producing works, distributing stations, and offices reaches into every corner of the nation, concentrating where industry's demands are greatest.

Thus, General has a flexibility and mobility that means swifter, surer service when great needs must be filled. For half a century this ability to serve best when hours count most has earned General the confidence of industry's leaders. Though long established, it must be ever new, for service is not measured in past performances.

This ability to serve can mean much to you, too! Learn now why so many specify General Chemical . . . first in Basic Chemicals for American Industry.

FOR AMERICAN INDUSTRY

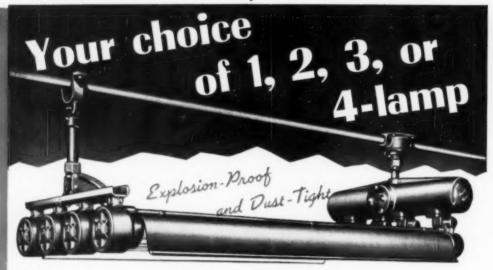
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GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Offices in Principal Cities from Coast to Coast



Fluorescent Lighting Fixtures in the complete CROUSE-HINDS

line designed to meet your requirements

EASY INSTALLATION

Crouse-Hinds Explosion-Proof Fluorescent Lighting Fixture CONDULET has a novel hinge connection between the lamp receptacle housing and the ballast housing that makes it unnecessary to raise and attach both ends of the fixture at the same time. With the tubes hanging straight down, the ballast end is connected to the supporting CONDULET. Then the relamping end is raised and attached, bringing the tubes to a horizontal position.

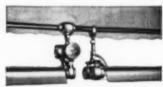
EASY MAINTENANCE

Relamping is a quick and easy one-man job. No special tools are required. Moving a link in the supporting stem assembly permits one end of the fixture to be lowered so that the lamp can be withdrawn. After relamping, simply lifting the lowered end automatically locks the fixture in its normal position. Saves time and money on maintenance.

QUALITY CONSTRUCTION

The ballast and lamp receptacle housings are of cast aluminum with unobstructed threaded covers to allow easy access to the interior. Each lamp is housed in an individual heat-resisting glass tube. The ballast housing is entirely exposed, resulting in a low operating temperature. The durable white enameled sheet steel reflectors are securely attached by spring clips. No tools are required to put them on a take them off after the fixture has been hung.

Write for full details on this modern Explosion-Proof Fluorescent Lighting Fixture CONDULET.



Type EVF Explosion-Proof Two-Lamp



End of One Fixture Lowered for Relamping, One Cover Removed and Lamp Partly Withdrawn

Takes standard 40-watt, 48-inch lamps.

*CONDULET is a coined word registered in the U.S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

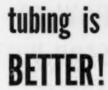
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here's why TRENT large diameter stainless steel





More and more fabricators, designers, manufacturers of chemical processing equipment are looking to Trent for their tubing requirements. That's because they have found that TRENT Large Diameter (4" to 30") Stainless Tubing is made by tube engineers to meet the strictest requirements of the trade.

When you do business with Trent, you get top quality tubing PLUS engineering consultant service that helps you put stainless tubing to work in your application . . . BETTER! Write for the Trent Data Bulletin and tell us what application you have in mind.

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better!

TRENT Large Diameter (4" to 30") Stainless Tubing is finished tubing — machine-formed, machine-welded, machine-sized for uniformity.

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TRENT Large Diameter (4" to 30") Stainless Tubing is made in a tube mill by tube experts,

better!

Tested cold rolled sheets . . . completely fused into finished tubing without added rod metal.

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No zone of weakness for corrosion to attack,

better!

Uniform section, metallurgically correct.

better!

Available for fabrication with your selected fittings... whether welding, van stone, or clamp type.

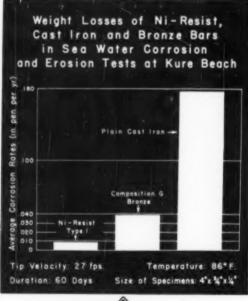
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All finishes available.



STAINLESS STEEL TUBING

HOW TO STOP WORRYING ABOUT SALT WATER CORROSION...





Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications."



One of the 586-pound pump cosings for Allis-Chalmers cost by Carondolet Foundry Company. St. Lauis 10, Ma., a licensed producer of Ni-Resist castings for the past 15 years.

...SPECIFY NI-RESIST CASTINGS

Ni-Resist®, a nickel alloy cast iron, provides a unique combination of properties at moderate cost. This readily machinable, corrosion-resistant nickel alloyed iron lends itself to intricate casting and provides an economical solution to many corrosion problems in the process industries.

Its superiority over a good grade of cast iron and G bronze in salt water service may be gathered from the chart at the left.

For instance, Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin, employed Ni-Resist castings for their 10 x 10 SF pumps built to handle salt water at one of the nation's large pigment plants.

*Reg. U. S. Pat. Off.

GET FULL INFORMATION ABOUT NI-RESIST

Two booklets are yours for the asking. One describes Ni-Resist properties, and includes corrosion data on Ni-Resist and cast iron under 400 different corrosive conditions. The other booklet lists producers of Ni-Resist castings.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET, NEW YORK 5, N. Y.



This machine in Signode's research laborators tests the tensile strength of steel strapping and also the joint strength of Signode reads. Six months ago a small midwestern manufacturer changed from his old way of packaging to new methods recommended by a Signode representative.

The savings ... in time, materials and freight costs ... amounted to a few cents per unit, but to this man those savings meant the difference between staying in business or going to work for somebody else.

Of course, we might just as well have cited the case of a large and well-known producer, but the fundamental facts would have been the same—only the total savings would have been different.

The point is that Signode Steel Strapping Company is as much interested in helping the little man save a few cents as the big man a fortune. For this is not a business of selling strap by the ton or tools by the gross, but of providing a needed service to industry . . . through the development and application of better ways of getting a product from its maker to its user.

To that end, all the activity centered around our box strapping, metallurgical and product development laboratories, our full size railway test track, and our field engineering service is directed.

Regardless of what or where you ship, it will pay you big dividends . . . in cash as well as customer good will . . . to call in a Signode representative, or be sure you hear his whole story the next time he calls on you.

SIGNODE STEEL STRAPPING COMPANY

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STEEL STRAPPING PROTECTS YOUR SHIPMENTS AGAINST DAMAGE

new Sirculating pumps Complete and brand

complete and brand new line of single and multistage turbine type pumps for cooling towers, irrigation, dewatering, river-intake, and drainage.

RUN THEM DAY AND NIGHT. These new BJ Pumps have the inside construction you need for continuous low cost operation. They are designed with strength for dependability. And for day and night operation, the BJ calibre of performance means a great deal.

THESE ARE NEW PUMPS, products of the latest thinking in hydraulics. They are backed by three-quarters of a century of experience in designing superior centrifugal pumps. BJ's new Vertical Circulating Pumps have the stamina, the "built-to-last" qualities for which

all BJ Pumps are famous. An illustrated bulletin describing these pumps is already printed...no delay...so write today for further information on how these pumps can help you.

Consider These Primary Advantages

minimum foundation requirements

remote control

simple fabrication . . . easy maintenance

your piping plans simplified

vertical installation saves you space

pumping efficiencies determined in BJ's new hydroulic laboratory.

Byron Jackson Co.

Since 1872

LOS ANGELES 54, CALIFORNIA

Offices in Principal Cities



USING 3 PUMPS PER STATION. Seven stations of a large gas transmission line are equipped with BJ Vertical Circulation Pumps. Each of the 21 pumps delivers 4500 gpm against a total dynamic head of 42 feet.



THESE PUMPS are selfpriming. Suspended vertically, they are self-contained pumping units taking suction from the pit in which they are mounted. USE MOTORS OR TURBINES AS DRIVERS in Cooling Tower Service. Each pump delivers 7500 gpm against 118 ft. head and operates at 1200 rpm. Three center pumps are direct-connected to explosion-proof motors. Two outer pumps are driven through reduction gears by 3600 rpm steam turbines.



THE versatility of this superior corrosionresisting and heat-resisting steel group has in recent years been constantly extended so that it is generally safe to say:—the more severe the service the greater the need for Stainless Steel.

In U·S·S Stainless Steel we offer perfected, service-tested Chromium and Chromium-Nickel Stainless Steels, not only in different analyses but in the most complete range of forms, sizes and surface finishes available anywhere.

Our engineers, who are specialists in the use of stainless steels, have behind them the research and laboratory facilities of the world's largest producer of fine steels. These facilities are available to tackle your problems where they involve severe or unusual applications.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, ONIO - CARNEGIE-ILLINDIS STEEL COMPORATION, PITTSBURGH & CNICAGO
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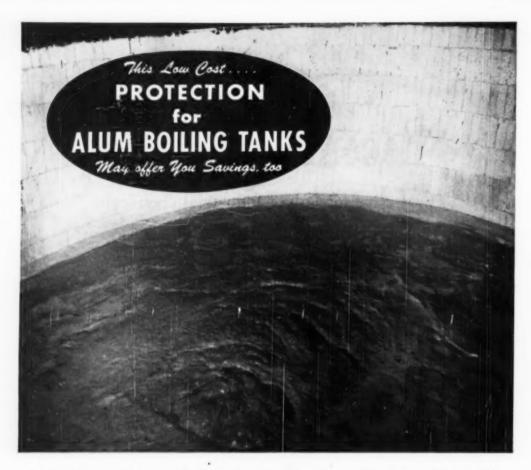


U·S·S STAINLESS STEEL

SHEETS : STRIP - PLATES : BARS - BILLETS : PIPE - TUBES - WIRE - SPECIAL SECTIONS

UNITED STATES STEEL

9-730



The manufacture and storage of liquid alum has (up until a couple of years ago) been handled in lead-lined steel tanks. The frequent and costly necessity of re-lining the tanks, particularly in the manufacturing process, led to an intensive search to find a less expensive and more certain protective material.

The answer to the manufacturing problem was found in the combination of U. S. Stoneware's Resilon membrane oversheathed with U. S. Stoneware's Acid-Brick bonded with our "Vitric-10" Acid-proof cement. Installations in the municipalities of Washington, Baltimore and Columbus have resulted in impressive savings. For example, the City of Baltimore estimates a cost of 32 cents per ton of alum produced for the Resilon-Acid-Brick lining against a cost of \$1.41 per ton for the lead lining.

Storage of liquid alum can be handled inexpensively in unsheathed Resilon lined steel tanks. U. S. Stoneware's Paraply rubber-lined steel valves and pipe complete a low cost corrosion-proof set-up. Whatever your tank lining problem, chances are good that among U. S., Stoneware's wide range of proven materials you can find a low cost and effective solution. We manufacture lining materials from Tygon and Duralon plastics, natural and synthetic rubbers, synthetic resins such as Resilon, sheet and homogeneous lead, as well as chemical porcelain, chemical stoneware, acid-brick and acid-andalkali-proof cements. We can thus recommend, without prejudice, the material or materials that will do the best job for you.



SPECIALISTS IN REDUCING PLANT MAINTENANCE COSTS THROUGH MORE EFFECTIVE MEANS OF CORROSION CONTROL

THE Chementator

COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

July 1949, Volume 56, Number 7

Carbide's coal hydrogenation plans

FIRST STEP—Carbide & Carbon has authorized construction of a coal hydrogenation plant to cost almost \$10 million. Design of this small commercial plant has been completed and equipment purchase orders are going out. The new coal hydrogenation plant is to be located at Institute, W. Va., where Carbide runs a butadiene plant it bought from the government. Carbide now also makes dioctyl phthalate at Institute.

FUTURE—Carbide may be gambling heavily on opening up a whole new realm of coal chemicals—that of naphthalene, anthracene and the higher multiple ring compounds. For when coal is hydrogenated these multiple ring compounds predominate among the products. (Distilling coal yields primarily such single ring compounds as benzene, xylene and toluene.) Carbide may feel that it has pushed its exploitation of ethylene and the olefin homologs almost to the point of diminishing returns. Hence Carbide takes this bold first step toward a future in a wholly new field of coal chemicals.

SIDELIGHT—Incidentally, Carbide has been cooperating fully with the Bureau of Mines on underground gasification of coal, but so far has refused to exchange any information with the Bureau on coal hydrogenation. However, Carbide did copy all the blueprints of German coal hydrogenation plants that the Bureau has.

Pneumatic feeder for pulverized coal gasification

At Morgantown, W. Va., Bureau of Mines engineers have come up with a new method for feeding coal to the synthesis gas generator of a synthetic liquid fuels plant. As a result, pulverized coal can be made to flow like water through a pipe to the generator.

When a bed of finely powdered coal is agitated to a "boil" by an air current, it can be fed into the generator at a constant instantaneous rate, unattainable with mechanical feeders. The new feeder promises to solve a knotty problem, for the synthesis gas composition will vary widely if the coal feed varies even for a fraction of a second. Gas of uniform composition is needed, of course, in the Fischer-Tropsch process for converting coal to oil.

With this new feeder, the quantity of coal that

can be conveyed by I cu. ft. of air is about 30 times that previously obtained in conveying practice. The coal, in transit, has the appearance of a solid stream flowing through a tube. The feeder also may be applicable for other finely divided solids.

Sites for synthetic fuels plants

SURVEY—Over \$1.3 million is being spent to discover suitable sites for synthetic liquid fuels plants in 37 states and Alaska. Army Engineers and the Department of Interior's Bureau of Mines have given Ford, Bacon & Davis, New York engineering firm, the job of deciding upon the best locations for plant construction.

EVALUATION—Instead of recommending specific plant sites, the survey will evaluate areas on the basis of raw material deposits of coal, oil, shale, natural gas or oil-impregnated strippable deposits. Consideration will also be given to water supply, power, transportation, labor, housing and markets.

Oak Ridge strike averted

The new Atomic Energy Labor Relations Panel stood ready to step into the Carbide & Carbon labor situation when a strike threatened at Oak Ridge. But a settlement was reached at the eleventh hour on June 8. The ClO Chemical Workers got a two-year contract and an 8c. hourly boost for the 2,000 workers it represents in the U-235 plant. The contract may be reopened on wages only next year.

In accordance with AEC's new labor relations policy, both the union and the company had agreed to maintain operations at least until the labor panel had had a crack at settling the union's demand for a 15c. wage hike. The company, with tongue in cheek, had proposed a cut of 6c.

Operating as he did as War Labor Board Chairman, William H. Davis, panel head, asked both sides to negotiate further before the panel moved in. It worked. Within a couple days a new contract was signed.

Bow gets government magnesium plant

Dow has just paid the Federal Works Agency a \$608,000 down payment on the government's virgin magnesium plant at Freeport, Tex., built by Dow in

(Continued on page 70)

Candy...or Coal

Fifteen sets of these nested coils for a chocolate manufacturer and eight extra heavy coils, such as that shown below, for a chemical plant, were fabricated by The Whitlock Manufacturing Co. of Hartford, Conn.

For processing chocolates or chemicals, storing liquid oxygen to blast out coal or providing pure drinking water from the sea, Anaconda Copper and Everdur Copper-Silicon Alloys meet exacting requirements of both fabricators and users.

Corrosion resistance and protection from contamination are of the utmost importance in the nested cylindrical coils for a candymaker, above left. The cast bronze terminal fittings are silveralloy brazed to the seamless copper tube. The coil at left, one of eight fabricated for a chemical plant is entirely of copper, including seven turns of 3" extra heavy copper pipe on a 42" diameter, copper supports, copper straps and copper rivets. Coils made by The Whitlock Manufacturing Co., Hartford, Conn.

+Reg. U. S. Pat. Off.

69152



Abore: Dishing welded two-piece head

Right: Argowelding circumferential seams joining the four sections

Below: Finished tank in position in steel casing



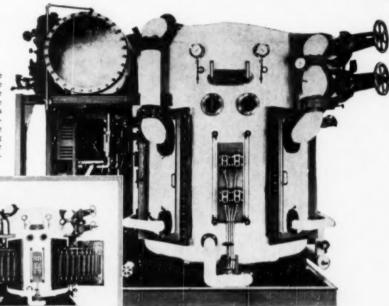
High strength, corrosion resistance and weldability led to the use of Everdur for a 4,000-gallon storage tank for liquid oxygen. This tank was designed and fabricated by L'Air Liquide Society, Montreal, Canada, for a U.S. coal mine, where liquid air and finely divided carbon are used in blasting.

The tank shell was fabricated in four sections, each consisting of two rolled plates welded together. The sections were then positioned and welded together.

Inert atmosphere arc-welding with water-cooled torches was employed for the more than 150-ft, of welding required.

... or Drinking Water

By opening the hinged doors of the welded Everdur evaporator shell, the copper heating coils for the two evaporation stages of the Paracoil Distilling Plant are exposed for cleaning and servic-



A recent development in seagoing fresh water supply is the new Paracoil Low Pressure (Vacuum) Double-Effect Salt Water Distilling Plant.

NOW...Extruded Everdur

LLLTI

in Structural Shapes The "double-effect" or two-stage evaporation is accomplished in the welded Everdur Shell, divided vertically by a double-walled Everdur partition. Shell for the distiller-condenser at upper left is also of welded Everdur. Condenser tubes are of 70-30 Cupro-Nickel and the helical evaporator heating coils are of copper.

Seven of these complete, self-contained units have been fabricated by

the Davis Engineering Corporation of Elizabeth, N. J., for as many Maritime Commission Design C3-S-A-5 cargo vessels.

Extruded structural shapes in Everdur 1010 Alloy are now available from stock in equal angles, unequal angles, channels, tee shapes and "I" beam sections. Sizes other than those regularly stocked may be furnished with fitting-up charges added.

These strong, corrosion-resisting, readily welded shapes are of prime interest to fabricators of heavy equipment for chemical plants, breweries, mines and ore-reduction plants, paper mills, oil refineries, railroads, water works and sewage treatment plants.

For further information and engineering data, address our Buffalo Branch: The American Brass Company, 70 Sayre Street, Buffalo S. N.Y. ANACONDA Anaconda COPPER E COPPER ALLOYS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut Subsidiary of Anaconda Copper Mining Company In Canada: Anaconda American Bross Ltd., New Terento, Oni

THE CHEMENTATOR continued

1941. The Munitions Board talked FWA into the deal over the objections of anti-trusters in the Department of Justice.

The Air Force put the pressure on the Munitions Board, which in turn talked FWA into approving the deal. Magnesium is needed to make military aircraft.

When the Munitions Board urged Dow to take over the government plant, Dow insisted that the sale be cleared by the Justice Department, where it was originally believed that the sale would run counter to certain anti-trust rulings. Since the government operation is closely integrated with Dow's own magnesium plant at Freeport, the Munitions Board decided that the national interest required that Dow buy and operate the plant. Further, it is reported, the Board got White House backing for the sale.

Dow paid \$608,000 cash and will make other payments based on production. At the end of five years, if the plant produces the expected 20 million pounds a year, the government will recover the full \$1,980,000.

This acquisition will double Dow's capacity for magnesium production, since its own plant is also rated at 20 million pounds a year, as is the one just obtained from the government.

Another hydrochloric plant for Texas?

New hydrochloric acid plant is rumored for west Texas. The Sid Richardson interests, holders of oil properties there, are considering an acid plant at Monahans or nearby Midland. Too, there is talk that the Western Co., a big acidizing and well-perforation outfit, may put up a hydrochloric plant in Midland.

Coal chemicals from Dixie

Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., is staking out a claim for itself in coal chemicals. With the help of the Southern Research Institute, Sloss-Sheffield is exploring the possibilities, may be turning out organics next year. A product getting close attention: para-cresol.

Buffalo's chemical boom gets another boost

New dyestuffs plant being erected by Allied's National Aniline Division in Buffalo is to cost \$3.5 million.

More than \$10 million has been spent in the Buffalo area in the past five years.

Added starter at Ashtabula

TRICHLOROETHYLENE—National Distillers Chemical has signed a long-term contract with the newly formed Hooker-Detrex to supply the latter with substantially all of the 27,000 tons of chlorine a year to be produced in the new \$10 million plant of National Distillers at Ashtabula, Ohio.

The chlorine gas will be delivered via pipeline to

the \$1.5 million plant that Hooker-Detrex is building next door to National Distillers. There it will be used to produce the metal-cleaning and oil-extraction solvent trichloroethylene.

SODIUM—The Ashtabula plant of National Distillers will turn out 18,000 tons a year of sodium, its principal product. One reason why National Distillers located there: all potential markets for its sodium are within 500 mi. of Ashtabula. (Present U.S. output of metallic sodium is 75,000 tons a year, all made by Du Pont and Ethyl Corp.)

Both the National Distillers and the Hooker-Detrex plants are expected to be up and running by April 1950

Do Pont moves into furfural chemicals

FOUR NEW ONES—Soon to be available commercially are four new Du Pont chemicals—all derived from furfural. The chemicals are pyrrole, pyrrolidine, methyl furan and dihydropyran. All are offshoots of Du Pont's process for making adiponitrile, a nylon intermediate, from furfural. They foreshadow a whole series of new chemicals. And development of this series opens up for Du Pont the entire field of chemistry based on the furan ring.

NYLON THE KEY—Basis for the development is the fact that Du Pont could move directly into large-scale processing of furfural. Production of even a part of the nylon intermediate demand already means volume production of furfural chemicals.

Du Pont's adiponitrile plant went into production late last year. When it started, it made available cheap furan and tetrahydrofuran. These form the basis for the new chemicals—and others to come.

OTHERS COMING—Among the compounds coming are acetopropanol and lysine. Acetopropanol is an intermediate in the vitamin B₁ synthesis. And production of lysine, an essential amino acid, may make available an important additive to protein feeds.

On trial: big new turbine

How good a job can gas turbines do in pipeline service? To find out, Tennessee Gas Transmission Co. is having a big turbine built. Specially designed for its job, the turbine will be built jointly by two upstate New York outfits—Frederic Flader, Inc., and Clark Bros Co., Inc., one of the Dresser Industries.

The turbine, a gas-fired unit, is expected to have better than 30 percent thermal efficiency. It will develop 5,500 hp, to drive a centrifugal compressor in a natural-gas transmission line near Moorehead in castern Kentucky.

The trial will ascertain whether gas turbines with high output and high efficiency are feasible as prime movers for long-distance transmission of natural gas.

Outcome of the turbine test will be awaited by the entire gas industry. Much current turbine theory (Continued on page 72) From SHELL CHEMICAL in trial-lot quantities

ACROLEIN

PROPERTIES

Melecular Weigl															
Specific Gravity	20/4	°C		ic.	*		*	*		×	×		×	*	0.8389
Melting Paint .				*	*	*	*	*		*	*	*		-	-86.9°C.
Boiling Point .					*		*		*		*				52.7°C.
Flash Point, Tog	Oper	2 6	UB					*					*	*	Below D'F

REACTIONS OF THE CARBONYL GROUP

Reaclant	Conditions of Reaction	Products of Reaction
		OH
KON	Glocial acetic acid in other sulution	CH ₂ CH—CH—CN acrolein cyanohydrin
Malanic acid	Pyridine solution	CH ₂ CH — CH CH — COOH 2,4—pentadienoic acid
		0
		O-C-CH3
Acotic	in presence of acid	CH2 CH-CH
ambydrala		O-C-CH ₃
		ecralein discetate
		OH
C ₂ H ₈ M _B Br	Grignard solution	CH ₂ CH—CH—C ₂ H ₅ 1—penten—3—o1
HCI (dry)	Low temperature	CI-CH2-CH2-CHO

PEACTIONS OF THE DOUBLE BONI

Furen	Presence of SO2 and high temperature	2-furangrapionaldehyde and 2,5-furandipropionaldehyde
Cyclopen- tudiene	Elevated temperatures	2,5—andomethylene—1,2,5,6- totrahydrobenzaldehyda
RSH	-	R—S—OHz—OHz—OHO β—olkylthiopropionaldahydo
Phonel	In presence of acid or dilute alkali	aldehyde type resins

A VERSATILE, EXTREMELY REACTIVE INTERMEDIATE

 Acrolein, a highly reactive unsaturated aldehyde, offers an almost unlimited variety of reaction possibilities.

Characterized by two functional conjugated groups, Acrolein has significant new-product potentialities. The olefinic bond and the carbonyl group may react independently, simultaneously, or successively.

Some of the products of the many possible Acrolein reactions are listed here. If you are working with any of these intermediates, we suggest that you investigate the feasibility and economics of the Acrolein route. We will be glad to discuss any possible use of Acrolein in your processes.

SHELL CHEMICAL CORPORATION

EASTERN DIVISION 500 Fifth Avenue, New York 18

WESTERN DIVISION 100 Bush Street, San Francisco 6

LOS ANGELES HOUSTON ST. LOUIS CHICAGO CLEVELAND BOSTON DETROIT NEWARK



THE CHEMENTATOR continued

is at stake. Tennessee Gas Transmission has taken a first big step toward greater economies in the movement of natural gas.

Advantages of these big turbines: (1) moderate installed cost per horsepower; (2) greater fuel savings; and (3) operation without water, all important for pipelines in the desert.

New beta-naphthol plant

The new \$1.5 million plant of Hilton-Davis in Cincinnati, Ohio, can turn out as much as 8 million pounds a year of beta-naphthol.

Majority of the output will be used by the producer. Hilton-Davis is a subsidiary of Sterling Drug.

French process for making urea

Foster Wheeler is designing a Pechiney process urea plant. Here is how this French process differs from Du Pont's: (1) carbamide is recirculated in oil solution; (2) it operates at a lower pressure; (3) it requires no silver; and (4) it can tolerate a fair amount of inerts in carbon dioxide—but no sulphur or oxygen.

How loans lead to sales and mergers

RESTRICTIVE LOANS—What is behind the current rash of mergers and sales of businesses or parts of businesses? One powerful factor: the restrictive clauses in long-term loans from banks and insurance companies. And even the best companies have had to go into heavy debt.

TIED-UP CAPITAL—Take Air Reduction, for example. In 1939 this company had \$16.5 million working capital and no debt. None of this money had any strings attached.

Today, Air Reduction has \$30.7 million working capital. But it has had to take on a debt of \$30 million. What is more, loan restrictions require the company to maintain working capital at \$22.5 million. Thus directors now have only \$8.2 million, or half as much as in 1939, that is really free and clear. Putting it another way, they have only \$700,000 working capital, free of debt. That is a great change.

SALES AND MERGERS—These loans often prohibit dividend declarations when working capital falls below a certain figure. When earnings are good but dividends threatened by restrictive clauses, the next step is to convert part of the property into cash. And from sale of a division or of a specific asset it is an easy step to a complete merger.

You can expect loans that tie up working capital to accelerate this trend.

C10 Chemical Workers close ranks

The CIO Chemical Workers are unifying their bargaining offensive against the drug manufacturers.

Six drug locals recently met in Washington and compared notes on what they are getting in their contracts and what they will demand this year.

A committee will draft a model contract to be presented to four drug makers with whom the union has contracts: Squibb, Parke Davis, Sharp & Dohme and United-Resall.

What the CIO Chemical Workers are really after is industry-wide bargaining.

Petroleum Industry keeps expanding

A special report on employment outlook in the petroleum industry is coming out of the Bureau of Labor Statistics for the Veterans Administration. This is what it shows on refining:

Employment, now 60 percent above 1939, will continue to expand. The rise will be greater than the increased capacity expected. With new capacity, refineries will operate at about 80 percent, instead of the current 95 percent of capacity.

Incidentally, wages of refinery workers are the third highest in the country, BLS finds. Only coal miners and newspaper mechanical employees earn more.

Chemical workers still getting 40 hours

Weekly hours of factory workers are holding up strongest in the chemical process industries.

Latest figures from the Bureau of Labor Statistics show that average hours worked in manufacturing plants dropped to just above 38 a week in April.

Of the four major factory groups which worked their plants at least 40 hr. a week during April, three were in chemical processing.

Fertilizer industry leads in mishaps

Worst accident record in the process industries in 1946, according to a Bureau of Labor Statistics report just out, was made by makers of fertilizers. There were 35.7 disabling injuries for every million hours worked, compared with a frequency rate of 15.7 for the chemical process industries as a whole.

In 1947 the comparable figures were 31.6 for fertilizers and 12.6 for all chemicals—a slight improvement.

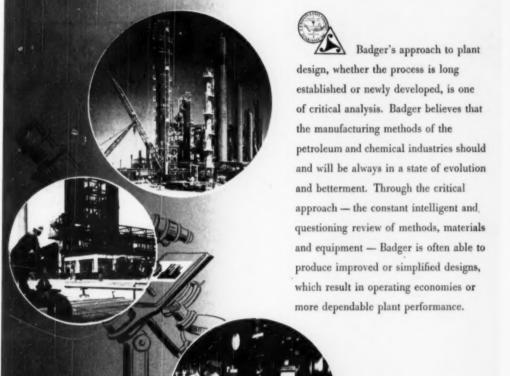
"It's wonderful"

The National Planning Association has issued five studies on the "Causes of Industrial Peace Under Collective Bargaining," including one on Dewey & Almy Co. A future study will deal with Sinclair Oil's relations with the CIO Oil Workers at its Marcus Hook, Pa., refinery.

Commies beware

If the publicity of the CIO Chemical Workers begins to look better, it is because of the new publicity (Continued on page 74)

THE CRITICAL APPROACH



E. B. BADGER & SONS CO. Est. 1841

BOSTON 14 . NEW YORK - SAN FRANCISCO - LOS ANGELES - LONDON

A SUBSIDIARY OF STONE & WEBSTER, INC.

THE CHEMENTATOR continued

director. He is Milton Murray, former president of the CIO American Newspaper Guild and a former Hearst newsman in Detroit.

When it comes to baiting Communists, Murray takes a back seat to few people.

Record sulphur production

Production of sulphur in 1948 topped the 1947 record by 10 percent. The Bureau of Mines figures: 4.8 million long tons in 1948, 4.4 million in 1947.

Export outlook for chemical products

CHEMICALS—Here is a quick look at the way government experts think the 1949 export market for chemicals will shape up: world market for U. S. industrial chemicals may drop as much as 20 percent below the 1948 total of \$137 million.

RUBBER PRODUCTS—Demand for rubber manufactures should pretty much hold its own, about equaling last year's \$125 million total for tires, tubes, hose, belting and footwear.

CRUDE OIL—Total crude oil shipments abroad are due to drop too, down 20 percent from last year's 39.7 million barrels.

Plastics extender from Brazilian coffee

IDEA—Archer Daniels Midland of Cleveland is flirting with the idea of making a plastics extender from Brazilian coffee. The process which ADM is eyeing was developed by Herbert Polin of the Polin Laboratories in New York. Blaw-Knox once built a pilot plant in Brazil to try the process out, but fullscale production never came. Now ADM has taken over the idea.

DEAL—Coffee to be used would come from old stocks held by the Brazilian government since depression days, when much excess coffee was burned or dumped into the ocean. The Brazilian government would thus provide the coffee, and profits from the sale of the plastics extender would be split 50-50 by Archer Daniels Midland and the Brazilian govern-

POLITICS—Final agreement depends on political angles in Brazil. The old National Coffee Department there is being liquidated. Also, there is considerable mystery about just what stocks are available and how much the coffee planters would get out of any deal.

Austria's chemical exports grow

Austria hopes soon to add chlorinated hydrocarbon solvents, such as perchloroethylene, to her export lists. Trichlorothylene is already an export commodity.

Other chemicals being sold abroad by Austria are chlorine, liquid sodium hydroxide, carbide, magnesite sinters and bricks, caustic magnesite, paper and paper products, and crude graphite. Paper accounts for better than 12 percent of the country's total export trade. Crude graphite is running out of the country's ears due to the postwar loss of the traditional German market.

Mechanical and solvent extraction combined

V. D. Anderson Co. has negotiated a contract with a U.S. company to convert the latter's present solvent method of oil extraction to a combination of mechanical and solvent extraction. This will be the third or fourth such installation in the U.S. For installing its new Exsolex process, Anderson will get a rumored \$500,000.

Anderson has just completed an Exsolex process plant at Johannesburg, South Africa, for Union & Congo Industries, Ltd.

The Exsolex process, which cannot be used to extract soybean oil, employs both continuous screw press and solvents.

Solvent extraction of soy ean oil up

Solvent extraction of soybean oil keeps growing. The chemical method was used on 37.6 percent of the 1947-48 crop, compared with 28.2 percent for 1945-46 and 26.6 percent for 1946-47, according to a Department of Agriculture survey.

Big reason for the increase: solvent extraction produces 10.7 lb. of oil per bushel, compared with 8.5 lb. by the hydraulic press method and 8.9 lb. with a screw press.

New gel from soybeans

Commercial production of the first practical vegetable protein gel is slated to get under way soon at the Peoria, Ill., plant of Allied Mills. The new soybean product has possibilities as an adhesive: the more it is heated, the harder it sticks, becoming practically waterproof.

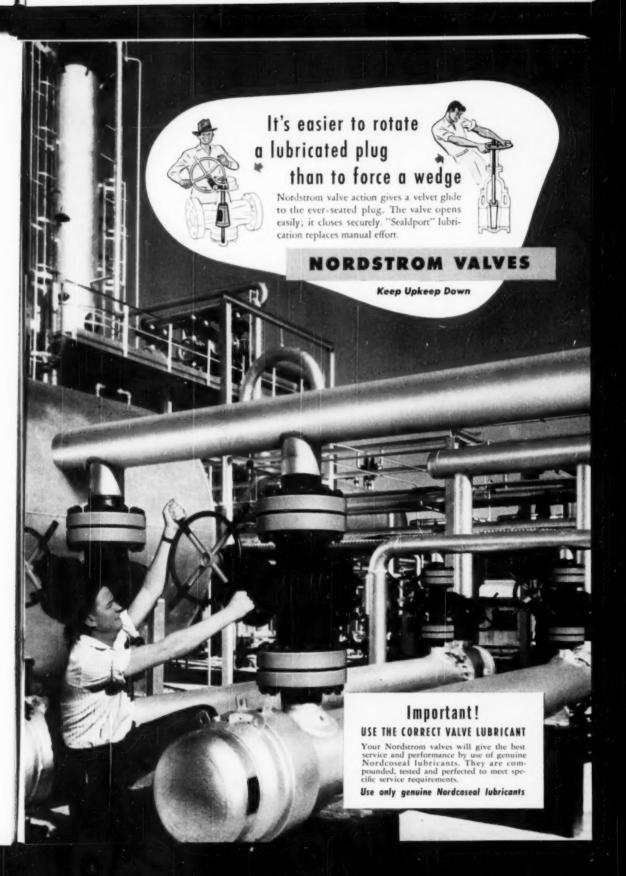
Half soybean protein and half carbohydrate, the substance was developed at the Northern Regional Research Laboratory of the Department of Agriculture in Peoria.

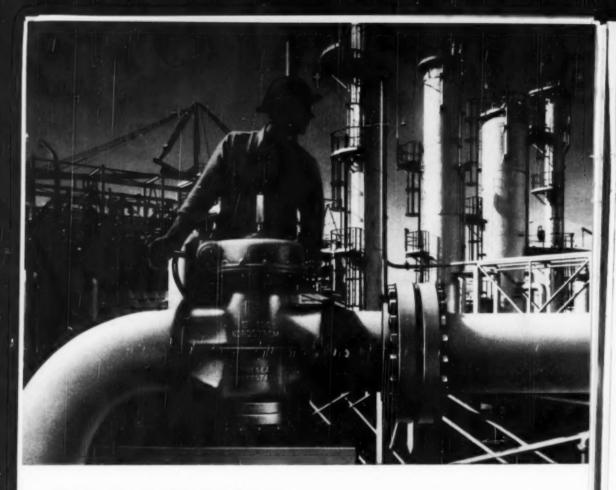
Anyone else wanting to manufacture the new gel can get a license from the Secretary of Agriculture simply by applying. No royalty fees have to be paid. Also, chemists at Agriculture's Peoria research laboratory are happy to show off their new gel to anyone stopping by.

Phenolics from waste wood?

Waste wood utilization is getting greater attention, particularly in the Northwest. Stanford Research Institute in California is working on fluidized carbonization of redwood wastes into phenolic chemicals and other products.

—End





Prevent costly shutdowns due to valve failures

-SPECIFY NORDSTROMS

Plants keyed to high efficiency, with investment of millions of dollars, must have the best valve protection. For instance, overhead and operation of a \$5,000,000 plant can easily run \$5000 per day—\$200 per hour. Merely a 4-hour shutdown due to a valve failure can cost \$800 or more plus valve replacement. But when your plant lines are controlled with Nordstrom lubricated valves, you avoid the hazard of valve failure and the cost of frequent replacement. Investment-wise, Nordstroms cost less than any other valves in terms of service and longer life.





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No pipe engineering job ever demanded perfection more than the world's largest solvent recovery system in the rotogravure printing plant of the Philadelphia Inquirer. In the first place, the link solvent is highly inflammable, corrasive and adoriferous. To satisfy strict safety requirements, corrosion-resistant stainless steel piping is jacketed in carbon steel piping and embedded in sand and concrete as shown in the drawing above. Special care had to be taken to assure perfection in every one of the thousands of pipe welds since no leakage or maintenance could be tolerated. Obviously, this recovery system was designed for permanence and to achieve this, it required the kind of "know-how" of pipe engineering that we have acquired during 50 years of solving the most complicated piping problems. In fact, for 30 years, we have pioneered in developing methods for welding stainless steel and now use the latest "inert-gas-shielded-arc" welding. For your next piping job, large or small, requiring stainless, alloy or carbon steel, you can depend upon the pipe fabrication methods we have perfected for the chemical and process industries.

1899

OUR 50th YEAR

1949

WESTPORT JOINT

REPRESENTATIVES IN BOSTON, NEW YORK CLEVELAND, MOBILE AND HAVANA

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MITCHELL

PIPING FABRICATORS AND CONTRACTOR



Do your piping systems include valvekilling services that build up excessive maintenance and replacement costs? If so, the new Jenkins Fig. 976-A Plug Type Bronze Globe Valve will produce important savings for you.

Install it where "wire drawing", due to close control of steam, knocks out other valves quickly—where entrapped chips, rust, or scale score the seats and start leaks. See how it defeats the worst valve enemies . . . how it sets new records for endurance and economy.

SETTING RECORDS FOR LONG LIFE AND LOW MAINTENANCE

For Science Sciences like ... PRESSURE REGULATION STEAM CONTROL BY-PASS LINES TEMPERATURE REGULATION APPARATUS THROTTLING BLEEDS, DRIPS, DRAINS SOOT BLOWERS CONTINUOUS BOILER BLOWDOWNS OPEN BLOWS ON BOILERS ANY CLOSE REGULATION OF STEAM

Na Many Industries like... DYE WORKS' BLEACHERIES BREWERIES' OIL REFINERIES' CREOSOTING PLANTS' PACKING HOUSES' MILK PLANTS' PLASTIC MOLDING PLANTS' HAT FACTORIES' GAS WORKS' TANNERIES' SUGAR REFINERS BOILER PLANTS' RUBBER MILLS

HERE'S WHY

The stout "heart" of the Fig. 976-A is the stainless steel plug and seat ring, hard enough (500 Brinell) to smash steel pipe chips without scoring, yet tough enough to take a nine ton load without cracking. Other features are . . .

MORE THREADS, LESS WEAR-Additional threads in bannet and on spindle assure full thread engagement lopen or closed), less load, less wear per thread.

NEW "TUFFARD" SPINDLE— Aluminum bronze (tensile strength exceeds 65.000 lbs.]—bough to take stresses, yet hard for long wear. Bigger in diameter, with more strong threads. NEW SLIP-ON, STAY-ON PLUG – Simple design with T-slot for engeging spindle head is stronger, frouble-free, and permits free flow. Mirror-finished bevel assures perfect matting with seat ring-

NEW STURDY LUG5 - Florfaced, V-shaped lugs an union bennet ring and bady ends, permit firm fit and grip of open end, pipe or teachey wrench—withstand repeated disassembly.

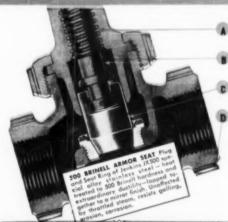
Jenkins Bros., 80 White St., New York 13, Bridgeport, Conn.; Atlanta; Boston, Philadelphia; Chicago, San Francisco, Jenkins Bros. Ltd., Montreal,

Get complete details in this new folder. Mail coupon, JENKINS BROS., 80 White St., New York 13, N.Y. Please send Armor Sent Valve Folder—Form 193.

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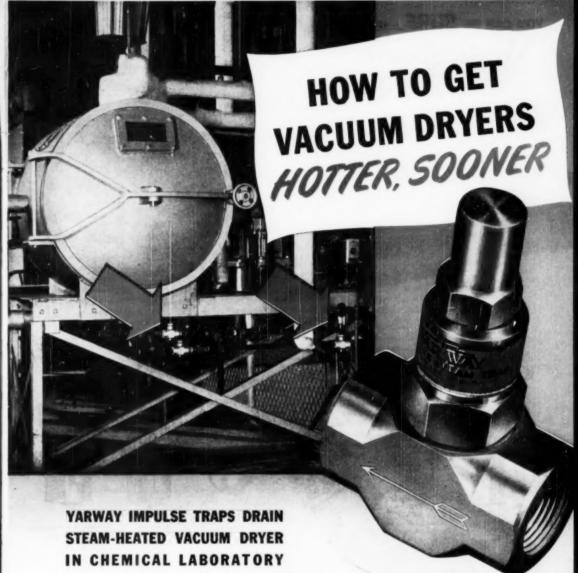


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VALVES

Types, Sizes. Pressures, Metals for Every Need



Industrial applications of high vacuum processing are constantly increasing . . . and so are installations of Yarway Impulse Steam Traps.

Here at the Eastern Regional Research Laboratory of the Department of Agriculture, three Yarways are shown on a steam-heated vacuum drum dryer in the Chemical Engineering and Development Division.

These and nearly 200 other Yarways used on various equipment in the laboratory, are doing a good job... and so they should. Yarways are famous for getting equipment botter, sooner, and keeping it bot. Continuous discharge under heavy

loads brings equipment to working temperature sooner; discharge at short intervals under lighter condensate loads keeps it bot.

Other Yarway features—one moving part, easy maintenance, small size, easy to install, suitable for all pressures, low price.

Try a Yarway today...standardize on Yarways tomorrow. See your local Mill Supply Dealer or write for Yarway Bulletin T-1739.

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OVER 600,000 ALREADY PURCHASED!

YOU CAN BE SURE .. IF IT'S Westinghouse







Turbe Generators



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Corresion Resisting Motor Control



Circuit Breakers for **Hazardous Locations**



Switches



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Oil Immersed Pushbuttons



Oil Immersed Punelboards



Westinghouse

Unit Responsibility

CUTS CHEMICAL POWER COSTS

The manufacturer of your steam and electrical equipment plays a vital role in providing the most efficient power system for your chemical processes. In serving you, that manufacturer should be capable of:

 Providing the complete line of power equipment your process may require.

Furnishing you co-ordinated engineering and supervision of installation.

3. Giving you the benefit of years of experience in the application of power equipment in the Chemical Industry.

These elements of unit responsibility add up to a reduction in costs. You get them all from Westinghouse.

Generation: Westinghouse gives you the complete installation for producing power, plus help in working out your electrical and steam requirements for the most efficient possible plant balance.

Distribution: Westinghouse makes a cor-

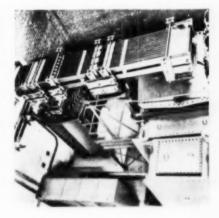
related line of distribution apparatus, ranging from the smallest arrester to the world's largest substation. All indoor and outdoor enclosures are Bonderized to resist corrosion, and outdoor switchgear is additionally protected by all-weather undersurface coating.

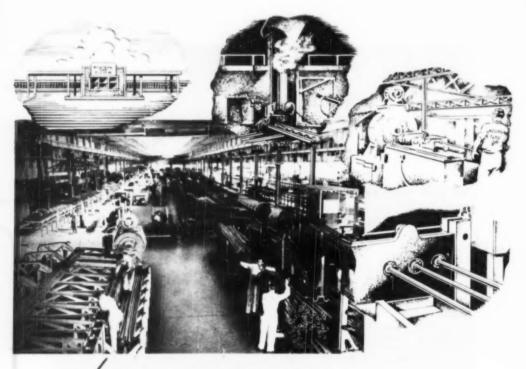
Utilization: Westinghouse makes a full line of mechanical drive turbines and chemical motors, ranging from small, explosion-proof, fan-cooled, Life-Line motors to the largest explosion-resisting, inert-gas-filled, squirrel-cage type motors ever built. A complete line of Westinghouse control, including corrosion-proof or explosion-proof types where needed, is also available to meet the rigid requirements of chemical plant service.

Give us an opportunity to assume this unit responsibility and help you find the solution to your chemical power problems. Call your nearest Westinghouse office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94804

(840w) Westinghouse Ignitron Rectifiers provide large blocks of rectified power. They carry heavy loads continuously, at full capacity, with safety and at low maintenance cost. (Right) Without this 40,000-ampere-series resonance furnace circuit, developed by Westinghouse, the power factor would have been 30°. In this chemical plant installation, use of the series transformer reduced installation cost and raised power factor to unity.







ORDER YOUR CONDENSER TUBES

Drom the most modern tube mill in the world

Located in the upper part of Alabama is the new mill of Wolverine Tube Division equipped to supply you with the finest seamless, non-ferrous tubing that science and skill can produce.

You can rely on the performance of Wolverine Tube because it is quality-controlled throughout its entire series of production steps—starting at the copper mines of our parent company. Calumet & Heela Consolidated Copper Co., to the time it leaves our shipping dock.

Consult with Wolverine engineers regarding your next condenser tube installation,



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Hooker Chlorobenzenes Available for Prompt Shipment

Hooker manufactures five chlorobenzenes, principal of which are monochlorobenzene and paradichlorobenzene. These products are of exceptionally high quality to insure the best performance in your applications.

If you are not yet familiar with Hooker quality and service, we invite you to test these materials. Literature and samples are available when requested on your business letterhead.

1, 2, 4-TRICHLOROBENZENE Tech.

C₆H₃Cl₃

Clear, almost colorless mobile liquid having a characteristic chlorobenzene odor. Completely miscible with most organic solvents; practically immiscible

	Ter states.	
PH	YSICAL DATA:	
	Mol. Wt.	181.
	F. P	10° 0
	Dist. R	to 235° (
	Sp. Gr., 15.5° 15.5° C L.	
	R. L. n20 D	$570 \pm .00$
	Flash Point	. 1180

USES: As an insecticide, it is particularly effective as a soil poison in termite eradication; solvent for fats, oils, waxes, resins; as a heat transfer medium; in chemical synthesis for manufacture of dye intermediates and other organic chemicals.

PARADICHLOROBENZENE

(1, 4-dichlorobenzene)

	C6H4C	12	
	transparent		

White to clear, transparent crystals with a pleasant aromatic odor. Soluble in most organic solvents; insoluble in water. Available in seven regular sizes.

1
Y
CI

PHYSICAL DATA:

DESCRIPTION

Mol. Wt.	147
M. P	
B. P	
Flash Point	
	108° C

USES:

Recommended and widely accepted as a highly effective insecticide for agricultural and domestic purposes in control of: peach tree borer, black peach aphids, tobacco blue mold, clothes moths, carpet beetles, fish moths, garden centipedes, etc. Also used in the manufacture of sanitary specialties such as deodorants. As a chemical intermediate in organic synthesis, it is used in the preparation of a variety of chemicals, especially dyestuffs.

Technical Data Sheets on the other Hooker Chlorobenzenes; orthodichlorobenzene, hexachlorobenzene, are also available upon request.

MONOCHLOROBENZENE

chloridei

DESCRIPTION:

DESCRIPTION

Clear. colorless, moderately volatile liquid, with a characteristic mild odor. Completely miscible with most organic solvents; immiscible with water.



PHYSICAL DATA

Mol.	W							112.5
F. P.							_	44° (
B. R			 	. 13	31.3°	to	13	2.300
Sp. (
R. I.	. n2	0/D						1.524
Flash								

USES:

Intermediate in manufacture of insecticides, dyestuffactures, sperfumes, and other organic chemicals; solvent for paints, varnishes, lacquers; general organic solvent; head transfer medium for condensing vapor systems.

From the Salt of the Earth
HOOKER ELECTROCHEMICAL COMPANY CHEMI

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8-82

CAUSTIC SODA - PARADICHLOROBENZENE - MURIATIC ACID - CHLORINE - SODIUM SULFIDE - SODIUM SULFHYDRATE

FOR YOUR INFOR ___ ATION



Recently completed additional manufacturing facilities further increase Mansanta's production of phosphorus phosphorus phosphorus phosphorus phosphorus

The world's largest electrical furnaces world's round the clock to refine Monsonto's elemental phosphorus of better than 90.9%, purity.

SOURCE OF QUALITY In Phosphoric Acid and Phosphates

Monsanto phosphoric acid and phosphates are derived from Monsantoproduced pure elemental phosphorus. From this pure phosphorus, qualitycontrolled Monsanto processes bring you phosphoric acid and phosphates with uniform, high quality. These products and some of their many uses are listed below. Information and prices will be sent promptly on request.

PHOSPHORIC ACID — Soft drinks, rustproofing compounds, metal cleaning, gelatin, jetly and preserves, textiles, sugar refining, pharmaceuticals, water treatment, electro-polishing.

SODIUM PHOSPHATES

Mono Sodium — Water treatment, textiles, acid cleaning compounds.

DI Sedium — Cheese, leather, textiles, detergents, water treatment, dve. piaments.

Tri Sedium — Water softener, detergent, metal cleaner, water treatment, textiles.

Tetre Sedium Pyre — Soap, detergents, cheese, textile dyeing, bleaching and finishing, metal cleaning, aid-dilling mud, water treatment, water softener, glass, degreasing.

Tri Pety — Soap, detergents, water softener, textile dyeing, bleaching and finishing, degreasing, metal cleaning, clay refining.

Acid Sadium Pyro — Baking powder, oil-drilling mud, electroplating.

CALCIUM PHOSPHATES

Mone Calcium — Baking powder, self-rising flour, prepared flour, mineral supplement. Di Celcium — Tooth paste, tooth powder, mineral supplement, pharmaceutical.

Calcium Pyro — Mineral supplement, pharmaceutical.

Tri Calcium — Tooth paste, tooth powder, anti-caking agent, mineral supplement, pharmacoutical.

AMMONIUM PHOSPHATES

Mone Ammonium — Fireproofing, yeast, malt, plant nutrient.

DI Ammonium — Fireproofing, yeast, plant nutrient.

POTASSIUM PHOSPHATES

Mone Petassium — Phamaceuticals.

DI Petassium — Fermentation, nutrient solutions, pharmaceuticals.

Tri Petassium — Oil refining.

Tetre Petassium — Soap, textiles, water softener.

FERRO PHOSPHATES
MAGNESIUM PHOSPHATES
ALUMINUM PHOSPHATES
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ALKYL ACID PHOSPHATES
ALKYL ALKALI PHOSPHATES
SPECIAL PHOSPHATES

ENJOY the interesting story of phosphorus in "Phosphorus... The Light Bearer," Sent upon request.

NEW PLANT FACILITIES ASSURE LARGER SUPPLIES OF SANTICIZER 141

Versatile plasticizer aids processing, improves quality of vinyl products

Recently completed manufacturing facilities now assure greatly increased supplies of Santicizer 141, Monsanto's versatile plasticizer for polyvinyl chloride and vinyl co-polymers. It is priced to compete with other primary vinyl plasticizers.

Santicizer 141's wide compatibility and strong solvent action make ponsible economical reductions in processing temperatures — permit broader choice of other compounding materials. It also contributes the following desirable properties to vinyl products: low-temperature flexibility, flame resistance, light stability, low volatility, resistance to embrittlement, low toxicity.

Detailed information on Santicizer 141 — and on other members of Monsanto's family of plasticizers and resins — will be sent promptly on request.



BOOKLET DESCRIBES MANY APPLICATIONS FOR PENTA

The industrial wood preservative

This booklet offers useful information on how Monsanto's PENTAchlorophenol can be used profitably to protect wood construction from decay and destructive insect attack.

Write for a copy of "Monsanto PEN-TAchlorophenol for Preserving Wood in Industrial Construction." Learn about this dependable, CLEAN, proved method of protecting your investments in wood.



BENTHAL

Improves quality of protective coatings at reasonable cost

Benthal* enables manufacturers of short oil modified resins to produce high-quality coatings economically. By replacing a portion of the dibasic acid with Benthal, a monobasic acid, it is possible to retard bodying, permit longer processing, thus reducing the acid value of alkyd resins.

Since Benthal becomes part of the resin molecule, it acts as an internal plasticizer — improves the flexibility and adhesion of dried films. Benthal is available for prompt shipment at reasonable cost . . For more information on its processing advantages, send for a copy of Monsanto Technical Bulletin No. O-D-503, "Benthal Applications in Alkyd Resins."

BIOLITE

New product developed for mildew control in laundries

A new Monsanto product, Biolite, has proved highly successful as a middew preventive. It is especially useful in laundries, and is being marketed through laundry supply houses.

Biolite is a formulation of Santobrite,* Monsanto's Sodium Pentachlorophenate, Technical. This is another new application for Santobrite, which is already used extensively for slime and algae control in industrial cooling water systems, microorganism control in pulp and paper manufacture, weed control.

AROCLOR 1248

Eliminates Fire Hazard In Die-Casting Systems

Monsanto's AROCLOR * 1248, nonflammable hydraulic fluid for metal die-casting machines, brings greater safety to the industry by eliminating the danger of fires. Economical? Of course! The cost of AROCLOR 1248 may be only half that of the fluid you now are using because of ARO-CLOR'S low price and low "makeup" requirement.

AROCLOR 1248 has given continuous, satisfactory service in individualized units for ten years . . . has delivered equal results in centralized systems for two years.

Look at these significant test results: AROCLOR 1248 has no fine point, spontaneous ignition temperature of 1,300° F. AROCLOR 1248 spray or mist requires 64% oxygen for combustion. These results establish the nonflammable and noncombustible qualities of AROCLOR 1248.

AROCLOR 1248 is noncorrosive and has such lubricating qualities that it usually is employed in discasting systems without the addition of other lubricants. For complete details, ask for Monsanto Technical Bulletin No. P-137.

NEW TEXAS CITY STYRENE PLANT DEDICATED IN APRIL



In April, Monsanto dedicated its newly reconstructed Texas City, Texas, styrene plant.

Highlight of the dedication was a ceremony to honor the memory of 145 Monsanto employes who perished when the styrene plant was destroyed by the explosion of S.S. Grandcamp, a nitrate-laden steamer.

The new plant embodies many improvements over the old installation—is now in full-scale production.

MANY INTERMEDIATES NOW AVAILABLE FOR PROMPT SHIPMENT

Offer wide possibilities for product development and improvement

Of interest to the chemical process industries is the wide selection of Monsanto intermediates now available for immediate delivery.

Some of these chemicals may well serve as stepping stones to development of new products, or to improvement of processes presently used,

para-Aminobiphenyl • para-Nitrobiphenyl · ortho-Anisidine · para-Anisidine · Benzoic Acid, Technical · Benzvl Chloride . Dichloroaniline . ortho-Chloroaniline • para-Chloroaniline • ortho-Chlorophenol • para-Chlorophenol · Cyclohexylamine · Dicyclohexylamine . Dinitroaniline . Dinitrochlorobenzene, 46.5° and 48° . Monsanto Salt (ortho-Chlor para-Toluene Sodium Sulfonate) . ortho-Nitroaniline • ortho-Nitrochlorobenzene · ortho-Phenetidin · para-Phenetidin · Phenol, U.S.P. · Phenolsulfonic Acid, 65% and 70% . Sodium Benzoate, Technical . para-Toluenesulfonamide • para-Toluenesulfonchloride · Toluenesulfonie Acid

*Reg. U. S. Pat. ()

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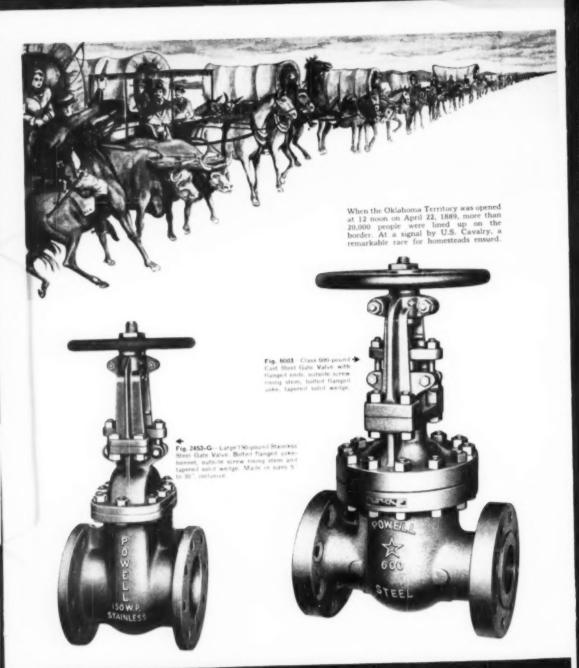
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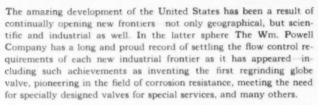


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Fig. 1969 - 150-pound Stainless Steel Gate Valve with flanged ends, outside scree rising stem, holted flanged voke-honned and tapered solid wedge. Globe Valves in this 4-holted, flanged voke-honned design are also available.



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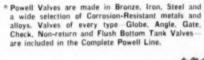


Fig. 1944 - Large 150-pount Stainless Steel
Y - Valve with flanged entity holded flanged yoke-bonnet and outside screw stem.



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Fig. 2433 -150-pount Stanless Steel Swing Check Valve with Hanger ends and bolted Hanger cap.

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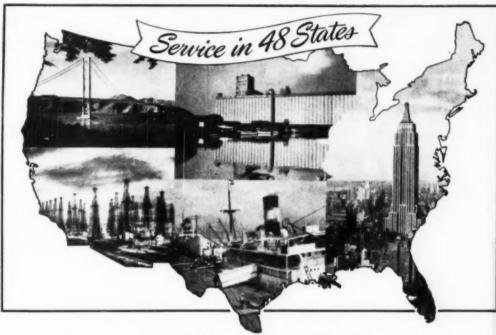
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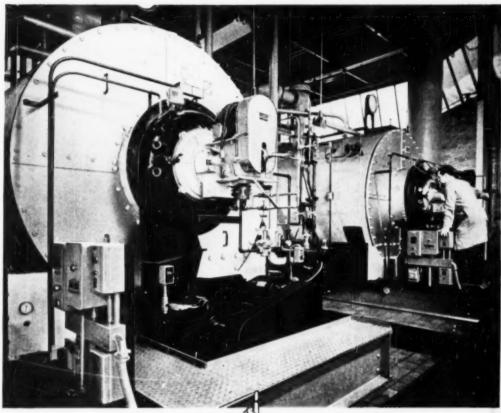
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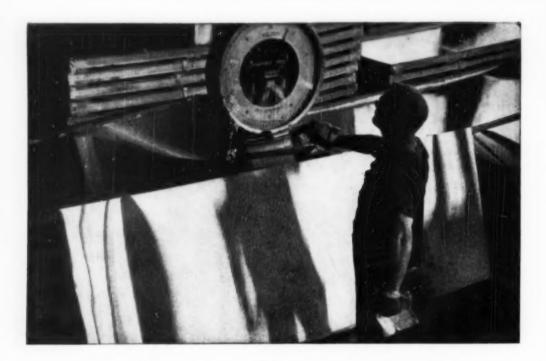
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Chemical Engineering

JULY 1949

Why We Favor a CMA

Chemical industry, for the first time in thirty years, may soon be headed by a single trade association. Not since the Chemical Alliance helped tide over the trying days of World War I, has there been such an opportunity for united action. Chemical Manufacturers Association would result from the expected merger of the 77-year old Manufacturing Chemists Association and the younger Synthetic Organic Chemical Manufacturers Association, that had its origin in the fight for the first dye embargo. From such distinguished parents it would inherit character, strength and confidence.

But CMA would also face problems that will call for real leadership—as well as generous support from the industry. The fine work that CMA has done through its technical committees on transportation and safety, stream and air pollution, must now be broadened to other problems in government-industry relations. SOCMA's experience in tariff matters and industry statistics is good foundation for further building. There remains the great, almost untouched field of public relations. Chemical industry has too long neglected its responsibilities for promoting a better understanding of its place in the national economy, its vital contribution to the public welfare.

Some will argue that this job can best be done by the National Association of Manufacturers. Others say that the bigger companies can and should promote the industry as a whole through their national advertising. A still better case can be made for joint operations at the level of the local communities. J. Warren Kinsman of the Du Pont company made such a plea to the MCA in an eloquent appeal for better public relations by businessmen.

"If America is to survive against the insidious encroachments of creeping socialism and fulfill its destiny," he said, "statesmanlike public relations must be undertaken by the responsible businessmen of the nation. Those of us who have the facts, therefore, have an obligation to do our best to overcome the economic illiteracy which now threatens the future of America. Surely, the truth about business and industry, about production, about prices, about profits, must be told by business leaders—if the truth is to be told at all."

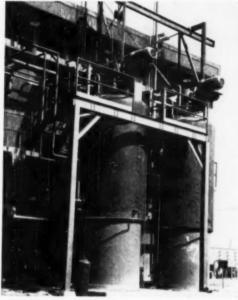
To confine this commendable activity solely to the "grass roots" level—or to share it only with the over-all program of the NAM—may prove a fatal mistake from the standpoint of the chemical industry. Our plants and processes are often difficult for the layman to understand and comprehend. As long as they remain mysterious and unintelligible, we are blamed for all manner of crimes and anti-social mo-

Not all of these problems can be solved at once. But as Warren Kinsman well said: "Let's be frank about it. If our predecessors in management two or three generations ago had devoted a mere modicum of their time to some individual soul-searching about their motives, about their good faith, about the responsibilities they owed the people, we would not be facing some of the tough problems that we do face today."

So in favoring the formation of a CMA, it is with the hope that a newer, broader gage of thinking—and spending—will characterize its future. The strongest, richest and technically the most progressive industry in the country cannot afford to be niggardly in its support for an able, well-managed trade association. What has been accomplished in other process industries—petroleum, pulp and paper, paint and varnish—can be done better by leaders like Merck, Rand, Kinsman and Munson—provided a united industry stands behind them.

Versatility in Fatty Acids

New General Mills plant combines hydrogenation and esterification units with hydrolysis equipment. Result: a greater variety of products Pictured flowsheet is on page 132.



HYDROGENATION CONVERTERS. General Mills put these in to guarantee outlets for plant's main product, fatty acids.

ROGER WILLIAMS, Jr.

Some 30 million pounds of fatty acid products are now rolling out of the brand new General Mills plant at Kankakee, III. This new plant, built to the latest Foster-Wheeler designs, is versatile in the products it can make. It not only has oil hydrolysis units but also has hydrogenation and esterification equipment. Perhaps the most interesting process on the plant is the high-pressure hydrolysis unit, a process licensed by Colgate-Palmolive-Peet.

Perhaps the best way to describe the operation of the plant is to follow the course of an oil through the various units. Various oils will be used, depending on supply and demand for the oils and products—the determining factors being costs of raw materials and prices for finished products. Among the oils to be used are tall oil, cotton-seed oil, soybean oil, and cocoanut oil.

Oils arrive by tank car and are pumped to storage by steam-driven reciprocating pumps. These pumps are located underground to facilitate feed to them from the tank cars. Oil storage consists of sixteen 85,000-gal. steel, heated tanks. Oil flow from these tanks to the process is through similar pumps to those unloading tank cars. From storage the crude oils can go to either the high-pressure hydrolysis sys-

tem, or to the plant's Twitchell unit.

The high-pressure hydrolysis system begins first with resin-lined weigh tanks. A pair of these tanks is used so that flow to the hydrolysis system can be continuous. From the weigh tanks, the crude oil is pumped through a steam heated tubular preheater to a deaerator.

From the deaerator, the hot, lowpressure crude oil is pumped to hydrolysis pressure by a triplex pump. Pump discharge is at 800 psig. The high pressure fats then are heated in a second, trombone-type preheater to the proper temperature for feed to the hydrolysis column.

HYDROLYSIS COLUMN

The high-pressure oils feed into the bottom of the hydrolysis tower. This tower is an empty vessel, about 3 ft. in diameter and some 70 ft. tall. It is lined with Inconel to minimize corrosion by the fatty acids formed in the process. Hot water is fed to this column at the top and flows downward countercurrent to the upward flow of oil. Effluent at the top of the tower is the hydrolized fatty acid stream together with some water. At the bottom of the tower the product is glycerine sweet-water. Live steam at 800 psig. and 500 deg. F. is introduced into the bottom of the tower to supply the additional heat for the process. The

tower contains no packing, nor does it have plates, except for a few diffusion plates at the top of the tower.

The product fatty acids stream from the top of the hydrolysis column contains some water, which must be removed before distillation. The pressure of the stream is let down and the hot liquid flows to a dehydrator. In the dehydrator, which operates under vacuum, this excess water is flashed off. The hot, mixed fatty acids are then pumped to intermediate storage.

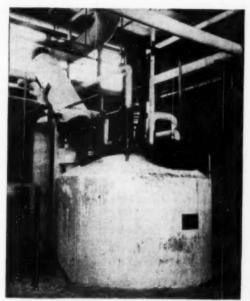
Glycerine sweet-water from the bottoms of the hydrolysis column goes to an additive mix tank, and from this unit through a filter before going to storage. Filter used is a leaf-type unit.

Giverine sweet-water is concentrated in a pair of continuous evaporators. These units are approximately 2 ft. in diameter and 20 ft. high. They can be operated either separately as single-effect evaporators, or together as one double-effect unit. They operate at between 26 and 28 in. of vacuum with heat supplied by 10 lb. steam. They are made of copper for heat-transfer purposes since the materials handled are not corrosive.

The plant makes no attempt to produce a pure glycerine and ships crude, concentrated glycerine to others for purification.

Supplementing the above continuous hydrolysis unit, the plant has four

ROGER WILLIAMS, JR., is assistant editor of Chemical Engineering.



ESTERIFICATION UNIT. Like hydrogenation, it is outlet insurance for fatty acids; converts them to drying oils.



HYDROLYSIS COLUMN. This continuous splitter is plant's mainspring; produces fatty acids from variety of vegetable oils.

large Twitchell hydrolysis units. These are large, conical-bottom tanks which are lined with Monel for corrosion resistance. Each unit operates on approximately a 12-hr. cycle, during which time the fat is added to the unit, hydrolyzed, and the products withdrawn. The process consists of adding about 40 percent water to the crude oil, together with small amounts of sulphuric acid and the so-called Twitchell reagent. This reagent is a sulphonated organic compound which catalyzes the hydrolysis reaction. Live steam is added to the tanks to supply the necessary heat and also to agitate the contents.

At the end of the reaction, the contents are allowed to settle, forming two layers. The fatty acid layer goes to the top and the glycerine sweet water layer to the bottom. These are then drawn off separately by means of a swing-pipe inside the tank and combined with the products from the continuous hydrolysis unit for further processing.

DISTILLATION

The next step in the plant is the separation of the mixed fatty acids by fractional distillation. This is done in two continuous distillation trains which operate in parallel. Each train consists of three columns, each of which is approximately 6 ft. in diam-

eter. They are constructed of stainless

The fatty acid distillation is a process licensed by Armour & Co. and contains tricks of design that increase efficiency and throughput. Just what some of those tricks are neither the designers nor the operators want to say. All distillation is done under vacuum, the maximum vacuum on the third column being 5 mm. Hg.

The first column either takes a top product cut, or the top product is considered merely an odor cut and is discarded. Which of these possibilities is actually done depends on the type of oil being processed. The column is a plate column, heated by a Dowtherm condenser which is built into the bottom of the column. This avoids pumping the hot tails product, a difficult job which would require high pump maintenance.

The condenser on this column is located directly at the top of the column. Vacuum on the condenser is maintained by a steam jet which also removes any non-condensables present. Liquid from the condenser flows by gravity to a reflux accumulator. From this tank reflux is pumped back to the column and the product top cut is pumped to storage or disposed of as an odor cut.

The second and third columns in each train are identical with the first

column in general design. Condensers are located at the top of the units, reflux is accumulated and pumped back. The one important difference is that the second column is built on top of the third column, utilizing the same shell and foundation. This design has reduced installation and equipment costs and will, hopefully, reduce maintenance.

In layout, all the pumping is done from the first floor and all control instruments are located on the second floor. Condensers are located at the top of each distillation unit. This type of location gives the height necessary for the barometric legs on the vacuum

The tails product from the third column may, if desired, be given an additional distillation in a separate column to produce specification pitch. This column operates batchwise and is also Dowtherm heated. The liquid batch circulates by temperature difference through an external heater which vaporizes part of the liquid. This stream then feeds the column, the tails from the column circulating back through the preheater continuously. Vapor from the top of the column is totally condensed and passes to a separator. Valuable fatty acids are taken from the top of the separator and returned to the third column of the distillation train. Residue from

the bottom of the separator returns to the batch residue column.

At the end of a batch, the remaining residue in the still is pumped to pitch tanks by steam jacketed gear pumps.

HYDROGENATION

The next process in the plant is the hydrogenation unit. In this unit fatty acids are hydrogenated so that any unsaturated bonds in the chain of the molecule will be completely saturated. The unit operates batchwise with solid catalysts suspended in the liquid fatty acid.

First step in the hydrogenation process consists of measuring out and reducing the catalyst. The solid catalyst and a small amount of fatty acid are mixed in an agitated scale tank which is heated with a steam coil to maintain the acid fluid. This mixture then goes to a reduction vessel where the catalyst is reduced with hydrogen at atmospheric pressure and high temperatures. The reduction vessel is agitated and is heated by electricity. The reduced nickel-fatty acid mixture then drops by gravity to a scale tank, which contains an agitator and steam coil, and then into the reactor.

The reactor consists of a stainless steel tank which has both steam coils, and an agitator. It operates at 200 psig, and 300 deg. F. Hydrogen addition is controlled to maintain the pressure constant. When the rate of hydrogen addition drops to a given low level the hydrogenation batch is completed.

Hydrogen for this unit is produced from propane or natural gas in a Girdler-designed reformer. This unit is small, consisting of only two reformer tubes, but will produce up to 150,000 cu. ft. per day of hydrogen averaging better than 99.75 percent purity.

Production of the high purity hydrogen needed in this case is somewhat different from the production of levdrogen for ammonia manufacture which has been described previously (see Chemical Engineering, Dec. 1945). In this case propane (or natural gas) is first vaporized and then mixed with steam. This mixture then passes through two 6-in. diameter tubes filled with active nickel catalyst. These tubes are built inside a bricklined, oil-fired furnace which supplies the heat necessary for the reaction. The reaction is operated at temperatures as high as 900 deg. C.

The reaction products from this unit, consisting of carbon monoxide, carbon dioxide, hydrogen, and water vapor, are cooled by direct injection of stram and then with additional steam passed through another catalyst bed. By using a large excess of steam the water gas equilibrium is so adjusted that the exit gas from this reactor contains very little carbon monoxide. This gas is then cooled in a water scribber and compressed to more than 300 psi, by two, steam-driven, reciprocating compressors. These compressors exhaust steam at 50 psigwhich is then used for process heating around the plant.

The compressed gas is then passed through three scrubbers operating in series where it is scrubbed with monoethanolamine. In the first of these scrubbers most of the carbon dioxide present is absorbed by the amine solutions. The gas is next heated, more steam added, and it is passed over another bed of water-gas catalyst. In coming to equilibrium over this catalyst bed, most of the remaining earbon monoxide is converted into carbon dioxide which is removed in the second of the three absorbers. This same process is repeated once again before the final purified hydrogen goes to storage and to the hydrogenation plant. The resultant hydrogen, at 300 psig. pressure, is some 99.75 percent pure and contains less than 0.01 percent carbon monoxide.

ESTERIFICATION

The plant also contains an esterification unit where any of the fatty acids or the hydrogenated fatty acids can be reacted to produce drying oils. There are two such esterification units.

These units consist, first, of weigh tanks for measuring the fatty acids and the polyhydric alcohol. These units feed the stainless steel kettles which are agitated and have a Dowtherm coil for bringing temperatures up to reac-tion conditions. These kettles can be operated either under pressure or vacnum. The Dowtherm coils can be used for heating or cooling as required. They are equipped with reflux condensers, total condensers, and steam vacuum jets. The product from this batch esterification goes to mix tanks where filter aids are added. Each mix tank is a stainless steel agitated vessel. From these tanks the slurry is pumped through Sparkler horizontal plate filters. The drying oil product is then pumped to storage.

All product storage tanks are housed within the shipping building and are mounted on scales. This facilitates determination of production, and keeps the fatty acids warm enough so that they will not freeze within the storage

Most of the products from the plant will be shipped in tank ears, but there will be some drum shipments, as well as some shipments of solid material in fiber containers and bags. To produce the solid products there is a stainless steel, single roll flaker. The flaker is 4 ft. in diameter and 12 ft. long and will produce 3,000 lb. per hr. of solids. Product from the flaker then goes to bag-filling machines.

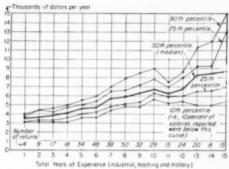
All bag-handling and drum-handling is palletized and fork trucks are used to move the pallets into and out of storage as well as for loading freight

Waste disposal at the plant is primarily a question of preventing grease from going into the sewer system and neutralizing the weak acid solutions which are produced in the various processes. Wastes are handled by passing all waste waters alternately through one of two brick lined tanks. In these tanks water is allowed to settle so that grease will come to the top and can be skimmed off. Lime is automatically added to neutralize the waste water. The grease skimmer at one end of each tank consists of a long pipe with an opening at the top, somewhat like the shape of the letter U. This long evlinder can be turned so that some water from the top of the tank flows into the cylinder, bringing the grease with it, hence skimming all floating oils from the surface of the waste water.

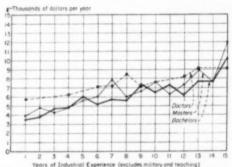
Water supply for the plant comes directly from the Kankakee city water system. Fresh water is added to one circulating water system, operating through a cooling tower which is used for all process cooling. Bleed from this system then goes to a second cooling water system with a separate cooling tower. This second system is used primarily for the barometric condensers. Because the water received from the city has already been chlorinated, there is no need for further water treat-

Steam supply for the plant is through two, 50,000-lb, per lir, boilers which produce saturated 250 lb, steam. They are of the spreader-stoker type and automatically weigh and feed coal. A Zeolite treatment is used on the feed water and the plant has a complete condensate return system. Steam going to the hydrolysis column must be at considerably higher pressure and temperature so it is fed through an auxiliary, small boiler which is fired with propane or fuel oil. This little boiler is located outdoors near the hydrolysis column.

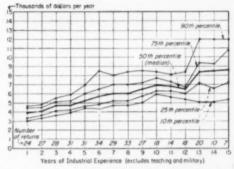
In conclusion the author wishes to acknowledge the assistance and cooperation of A. P. Berry, plant manager of the Kankakee plant, and F. B. White, Foster-Wheeler Corp., under whose direction much of the processing equipment was designed.



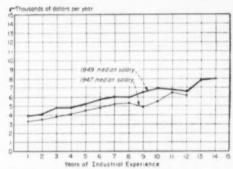
Salary range for young chemical engineers around New York.



Advance degrees don't guarantee big money, but they help.



Same as left, but excluding military and teaching experience.



Chemical engineers' salaries are well above 1947 levels.

Salary Survey

Where do you fit in this picture?

RICHARD F. WARREN

What are you worth to your boss? How does your salary compare with what other chemical engineers get? With these questions as a basis the New York Section of the American Institute of Chemical Engineers and the Junior Chemical Engineers of New York conducted a salary survey in that area last month. The following questions were asked:

(1) How many years of experience have you had (through the nearest full year)? (a) Industrial, (b) teaching, (c) military.

(2) Are you now in industrial, teaching or military fields?

(3) What degrees do you hold?

(4) What is your present salary in dollars per year without overtime?

The 361 usable returns from young chemical engineers

RICHARD F. WARREN is assistant editor of Chemical Engineering and chairman of the salary survey committee of the Junior Chemical Engineers of New York. in the New York area were plotted in the accompanying graphs. Two accompanying charts show the breakdown of salary by percentiles. The first chart shows experience of all types including military, teaching and industrial plotted against annual salaries. The second chart shows industrial experience only. In the preparation of this chart military service and teaching experience were ignored. The number of teachers reporting was very small. Therefore, a comparison of the first two charts shows that with the removal of the military experience the salary level for chemical engineers in the first four years is considerably higher.

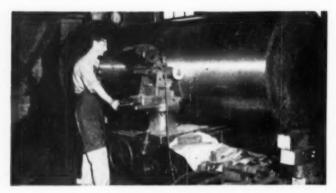
A question often asked by young chemical engineers with military experience is, did I gain or lose financially as a direct result of my military service? These charts indicate that some financial setback did occur.

A similar survey was conducted by the Junior Chemical Engineers of New York in 1947. At that time, salaries for the class of 1938 were below those of the class of 1939. This same dip appears in the current survey. Evidently, since it was a year of economic recession, these men started at lower levels and never quite caught up, salarywise, with following classes.

Another question often asked by chemical engineers is, what good are advanced degrees? The answer is that advanced degrees do not guarantee big money, but they help. This is shown by graph No. 3.

Perhaps the most significant chart is the one which shows that, compared with a salary survey made in 1947, the chemical engineers in all experience ranges are making considerably more money than they did at that time.

METALLIZING: How They Put



SURFACING CAST IRON ROLL WITH STAINLESS

Obtaining a 6,300 lb. stainless steel chill roll for an animal fat rendering plant is no small problem. In fact, one plant found that it would take many weeks to get one 49 in. in diameter by 9 ft. long. The Dix Engineering Co. at Lincoln Park, Mich., solved the problem for them by spraying stainless steel on a straight cast iron roll. The photograph shows the metallized roll being finished with a tool-post grinder.

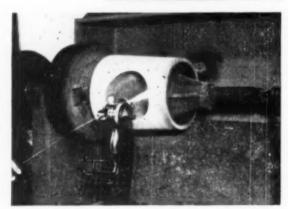
A roughing cut was taken over the



TIN-COATING ALCOHOL TANK

Metallizing steel storage tanks with tin has proved a practical way of preventing contamination of alcohol. Quite a good many tanks have been done over the years. Some of the earliest sprayed tin coatings were not altogether satisfactory due to the porosity of the sprayed tin. However, a technique has been worked out to seal such coatings quite effectively.

Tanks to be tin sprayed are first carefully blasted with G-16 angular steel grit to clean the surface and roughen it. Blasting is done with a pressure blast machine using about 100 psi of air pressure, and the work is continued until no dark spots remain in the blasted surface. It has a dull gray appearance all over when properly blasted. Furthermore, only as much surface is blasted at one time



RESTORING A PLUG COCK

In the processing of some chemicals, plug cocks are used for various purposes. In time, they wear and lose their fit. Metallizing has proved a practical and economical way of rebuilding them to standard size, or, where the valve body is bored oversize, to the new diameter. This photograph shows a typical plug cock being built up with Monel.

Due to the ports in the plugs, which interrupt the surface and prevent a continuous metallized coating, a strong bond must be provided. The method used to prepare these surfaces for metallizing is to take a light roughing cut to even up and clean the surface.

It to Work in Chemical Plants

J. E. WAKEFIELD

surface to clean it up. Next, a square thread, 14 to the inch, was cut over the entire face. This cut up the cast iron and left an excellent bond for the spraved stainless steel.

A high speed, heavy duty metallizing gun was set up, using & in. diameter wire. The metal selected was an 18-8 type stainless steel, due to its high resistance to corrosion. It took three 8 hr. shifts to complete the metallizing, since & in. of metal was applied all over. It took close to 500 lb. of metal for the desired thickness: the gun sprayed an average of almost 21 lb. per hr.

In finishing, a Carboloy tool was

used to bring the coating down to within 0.005 in. of the final size, and then the work was completed with the tool-post grinder. Metallizing represented a tremendous saving in money and, more important, in time.

An even larger roll was metallized by the Thornton Co. at Cleveland for a synthetic rubber plant. This particular roll was 9 ft. in diameter and 9 ft. long. Due to its size and weight, work was done in position. A special lathe arrangement was rigged up on the machine so that six metallizing guns could be traversed simultaneously across the surface.

This roll, too, was metallized with

18-8 stainless steel. A light cut was taken over the surface first to true it Then, a threading tool, and another to remove loose slivers, were mounted on the carriage ahead of the metallizing battery. In this way, the entire operation was carried out in one pass across the surface. The work was completed in four days, by using two crews of two men each.

When it comes to surfacing freeze rolls, chill rolls and similar processing equipment, metallizing is at its best in high speed and low cost. Monel, stainless steel, nickel or Nichrome can be applied to cast iron, steel, or other

metal bases.

as can be coated in one 8 hr. shift. This prevents dirt from collecting on the cleaned surface or the formation of oxides

Immediately after blasting, the surface is sprayed with 0.0015 in, to 0.002 in, of 0.10-percent carbon steel. It has been found that a flash undercoat of steel greatly increases the bond of sprayed tin to the tank and also prevents blistering of the coating where it is immersed in liquid. One pound of tin wire is laid out for each square foot of surface to be covered to produce a coating 0.020 in. thick. The tin is applied in alternate vertical and horizontal passes, and in this way distributed as evenly as possible over the area measured out. Even rather inexperienced operators can produce a quite uniform coating by spraying a predetermined quantity of wire on a measured area. After spraying, the

coating is checked with an electric thickness gage and any thin spots touched up.

Blasting and spraying is continued until the full interior of the tank is coated. On the first tanks, no attempt was made to seal the coating and some iron rust ded come through. Nowadays, tin coatings are sealed by lightly blasting with No. 16 round steel shot. The pressure blast machine is used, but with pressures reduced to 35 to

Where coatings are to be sealed by this method, it is important to do a thorough blast job for preparation and then use the steel flash undercoat. Otherwise, the bond might not be strong enough to take this later blast peening operation. The undercoat and the sealing operation tend to prevent blistering of the coating when immersed.

The illustration shows tin being sprayed on a tank 124 ft. in diameter by 25 ft. long. Two metallizing guns are being used to speed up application.

Since the early tanks were done in 1936 and 1937, a considerable number of others have been sprayed, ranging in size from relatively small ones up to tanks with a capacity of many thousands of gallons. In some cases, for liquids other than alcohol, lead coatings have been applied. nique is much the same as described for tin, except that lead coatings are generally applied 0.030 in. thick.

Early failures of metallized coatings on this type of application discouraged their use to some extent. Modern techniques, and a much greater knowledge of sprayed metals themselves have proved their usefulness to plants handling or storing alcohol and some

other chemical solutions.

Then, it is threaded using a 0.045 to 0.050-in, wide square-nosed tool, Threads are cut 14 or 16 to the inch and about 0.015 in. deep. Tops of the threads are roughed further by using a special tool.

The first few passes of the gun across the surface are made with the gun at 45 deg. to the work, each way. After the grooves are pretty well filled, the gun is mounted on the tool post of the lathe at 90 deg, and the build-up completed. The coating is built up 0.04 in, above desired size to allow for machine or grind finish.

Finishing can be done on most sprayed metal coatings by machining with ordinary tools. With Monel and 18-8 type stainless steel coatings, a

coolant will produce a better finish. A still better one can be obtained through the use of Carbolov or other cemented carbide tool, or by wet or dry grinding. Wet grinding should be done with a wheel of coarse grain and low bond strength.

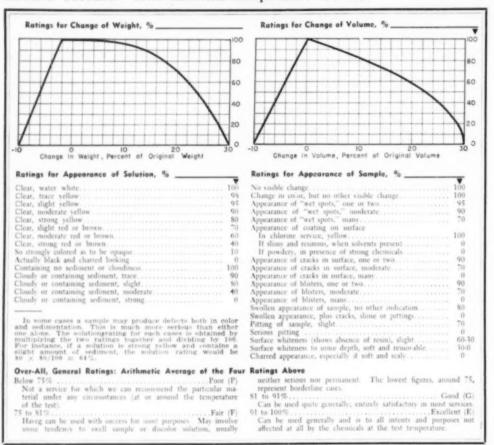
Various sizes of plug cocks have been metallized successfully, ranging from 14 in. in diameter all the way up to 8 in. In metallizing, it is desirable to use the same material for rebuilding as the original, within reasonable limits. Hence, Monel cocks should be done with Monel and so on.

Due to the design of the cocks, metallizing is about the only practical way to rebuild them. Modern metallizing guns spray as much as 20 lb. of 18-8 stainless steel, using a & in. diameter wire, in an hour, so that a repair operation can be completed in a very short time.

When wear on plug cocks is a problem in chemical processing plants, metallizing can be a real solution. This is another of the many applications in liquids handling equipment where a metallizing gun has proved to be a very versatile "putting-on" tool.

J. E. WAKEFIELD has been in the metallizing business for 14 years-4 as a metallizing contractor and the last 10 as sales engineer for Metallizing Engineering Co., Long Island

RATING SYSTEM: Gives numerical interpretation of results.



New Corrosion Test for Plastics

W. H. ADAMS and H. H. LEBACH

In recent years the use of plastics to resist corrosion in industrial equipment has become important both to the manufacturer of plastics and to the engineer responsible for the selection of equipment. Not only are there available various coatings and linings of natural and synthetic rubbers and resins, but there are also obtainable resinous compositions factory-fabricated into self-supporting tanks,

W. H. Adams, until his death, was technical director of Haveg Corp., Newark, Del. H. H. LEBACH is in Haveg's research department. towers, pipe, fittings, valves, pumps and a host of other shapes. These items have become widely known and used in the process industries in the last 15 years.

The application of these materials in industry is largely a question of their chemical resistance. Each manufacturer tries, therefore, to provide as accurate a table of chemical resistance for his particular material as he can. Wherever possible, his recommendations are based on actual field experience, but whenever a new or modified grade of material is under study, this must be supplemented, if not

largely supplanted, by laboratory tests of one kind or another. It is most unfortunate, therefore, that no real standardization of method exists. Nor is there any agreement among manufacturers and engineers as to what constitutes a good method.

Having had this problem confronting us for many years, we have considered many test procedures. As a result of long study we have evolved a statistical laboratory method which involves several variables, and which seems to duplicate field results with considerable accuracy.

It is the purpose of this article to

RELIABILITY: Test results check with field experience.

							REST		FIELD
	Cote.	Temp.	Weight	Volume Volume	lual Ratings- Appearance	Solution		Gen I Rating	
Hydrochloric Haves 41 Haves 41 Haves 41 Haves 41	35 20 20 20 20	25 25 50 100	97 96 99 100	92 92 97 94,5	100 100 100	90 90 90 90	94 8 95 3 96 5 96 2	E E E	Highly Satisfactory
Haveg 60 Haveg 60 Haveg 60 Haveg 60	35 20 20 20	25 25 50 100	99 100 100	92 98 95 84	100 100 100	95 80 90 86	96.5 94.5 96.3 92.5	E E E	Highly Satisfactory
Sulphuric Ack Haves 41 Haves 41 Haves 41	50 50 50	25 50 100	99 99 99	88 98 92	100 100 100	100 100 100	96.8 99.3 97.8	E E E	Highly Satisfactory
Haveg 60 Haveg 60 Haveg 60	50 50 50	25 50 100	100 100 99	100 97 93	100 100 100	98 95 64	99.8 98.0 89.0	E E G	Highly Satisfactory
Acetic Acid Havez 41 Havez 41 Havez 41	[60 100 100	25 50 100	88 85 92	32 41 75	100	98 100 95	79.5 81.5 90.5	F G G	Known strong tendency to swel Serious in some cases. Border line at 100°C
Haveg 60 Haveg 60 Haveg 60	100	25 50 100	100 99 100	84 82 98	100 100 100	90 90 x	93.5 92.8 99.3	E	Satisfactory
Sedium Hydro Haveg 41 Haveg 41 Haveg 41		25 50 100	X X X	X X	0 0 0	X X X	0 0 0	Is Is	Completely unsatisfactory
Haveg 60 Haveg 60 Haveg 60	20 20 20	25 50 100	100 99 83	87 96 50	100 100 100	X X X	95.7 98.3 77.7	E	Highly Satisfactory
Nitric Acid Raveg 41 Haveg 41 Haveg 41	5 5	25 50 100	100 99 100	60 98 99	100 100 70	0 90 100	90,0 96.7 67.2	G E P	Although not usually recommended, Haveg 41 has been used successfully cool, but not hot

PROCEDURE: Simple enough to be practical.

- Cut samples about & x & x 1 in.
 Weigh on analytical balance to third
- decimal. 3. Obtain specific gravity and calculate original volume. (Wt./Sp. Gr.). This need not necessarily be done with each individual block or sheet, an average specific gravity determination on 3 or 5 pieces can be used as a basic figure all volume calculations of the intreated material.
- 4. Place in a 2 in. diameter test tube 6 in. long. For strongly alkaline solutions steel containers are advisable but may not allow color evaluation due to rust formation. Stainless steel or Haveg-60 containers are alternatives. With hydrofluoric acid and its compounds at elevated temperatures Haveg-45 or 48 can be used,
- with Haveg 48 first choice since it is inanufactured from pure phenolic resin without any filler.
- any filler.

 5. Draw out end of test tube to a capillary in a blast lamp.
- pillary in a blast lamp.

 6. Place tube and sample in a beaker of test solution, with capillary down, in a
- vacuum desiccator.

 7. Apply and release vacuum, filling tube by suction, to about 3 in. depth over appole.
- 8. Warm tube and contents to about the temperature of test.
- Seal capillary in a blast lamp.
 10. Place in oven or water or oil bath at temperature selected for duration of test.
- 11. After test is complete, break off tip

of tube in order to release any possible pressure. Then first observe solution, noting especially the color and whether the solution is cloudy or contains sediment. Rate the solution in accordance with the method

- given opposite.

 12. Cut off top of tube, remove sample, wipe dry, place in a weighing bottle and
- weigh without delay.

 13. Observe the sample for any visual disintegrative changes. Apply a rating by the without study dispersion opposite.
- the method given opposite.

 14. Obtain specific gravity with greatest speed possible. We always used a Joly balance. Calculate final volume.
- 15. Calculate change in weight and change in volume and arrive at weight and volume ratings from graphs opposite.

explain and describe this method, and to show how it has worked in evaluating the resistance of various grades of our own material, Haveg, Haveg is made of phenolic or furan resin, filled either with asbestos or graphite. It is our hope that the method may be helpful to other manufacturers and engineers in evaluating the chemical resistance of Haveg or other plastics under new conditions.

PREVIOUS TEST METHODS

The corrosion test most often used for metals, and the one nearly always tried by engineers not familiar with plastics, is the weight loss test, variously reported as "grams lost per square centimeter per year" or "inches penetration per year" or in some such manner.

Now weight measurements on a plastic are more likely to show a gain than a loss—and neither a gain nor a loss in a plastic has necessarily any significance as far as chemical resistance is concerned. Plastics usually contain some volatile matter which may be lost, and they are frequently slightly porous or absorbent and could, therefore, absorb solution and increase in weight. Therefore, no one can tell

ahead of time which way the weight changes may go. Unless they are excessively large and confirmed by other observations, they may have no significance of chemical resistance whatever.

Losses in weight, and even rather considerable ones, may in some cases be due simply to loss of volatile matter (this is, with some other plastics, frequently evaporation of plasticizer). Losses due to such cause have not any significance regarding chemical resistance unless accompanied by other signs of deterioration.

In the new test such volatile losses

could be overcome by thorough conditioning of the samples but this is time consuming and, in case of regular

Haveg, unnecessary.

Another procedure much used for testing the chemical resistance of plastics is the ASTM Standard Method D-543-43. This method is not very definitely fixed, as it recommends various changes depending on the purpose of the test. However, it includes a study of weight changes, dimensional changes as obtained by measuring samples with a micrometer, and changes in appearance.

The chemicals recommended for test are very dilute for the most part, and the time of contact is only 7 days at 25 to 30 deg. C. This is very much too lenient treatment for materials like Haveg, which will frequently be in contact with strong boiling acid or alkali and are expected to stand up

for a long time.

H. E. Riley (Ind. & Eng. Chem., Aug. 1936, pp. 919-922) reported on chemical tests with phenol resin bonded laminates. His method of testing individual samples at different temperatures for an extended period of time (up to 180 days) is very similar to the procedure described below, but it gives only results and leaves it to the chemist or engineer to form his own judgment. Riley uses two fairly moderate temperatures, 77 and 140 deg. F. and records weight and dimensional changes. He adds remarks on the appearance of the samples without saying what this appearance signifies. There is no evaluation of the effect of the test on the chemical used in each case.

The use of micrometer measurements to determine swelling or shrinkage has been found by us to be almost wholly inadequate because of an occasional tendency toward warping and because it is almost impossible to place the micrometer in the same spot

each time.

Finally, three things—the type of samples used in D.543-43, the emphasis of the test, and the nature of the reports called for—all imply use with laminated plastics, which generally are not designed for severe chemical service. The test is, therefore, not really adapted to the type of work we have had to do. It is, however, much better than most of the previous tests, and some worthwhile information can be obtained from it.

G. M. Kline, R. C. Rinker and H. F. Meindl (ASTM Proceedings, 1941, pp. 1.246-1.257) have extended the method of ASTM D-543 by immersing their samples for 60 days and then conditioning them for four weeks at room temperature. The small changes found in most cases—with the understandable exception of sodium hydroxide—prove that this procedure is insufficient to allow a proper evaluation of resistance in manufacturing processes or storage in the chemical and allied industries.

Another method (J. Delmonte, Modern Plastics, Dec. 1942, pp. 91-Delmonte. 94+), which is recommended as supplementary to the ASTM D-543-43. and which is also used by some manufacturers, is the determination of physical strength before and after treatment with the chemicals. On the face of it, this seems like a pretty good test, but on careful examination certain difficulties and problems show up which make it of fairly little value. First, the changes made by chemicals in a material like Haveg are less than the errors in the strength test itself: therefore, only gross effects are likely to be shown. Second, at least five specimens need to be broken both with and without the acid treatment. and these samples need to be machined. The amount of work and the expense involved in any comprehensive series of tests is, therefore, quite prohibitive. Third, a discrepancy is practically certain because absorption of solution alone will be sure to change the strength values without necessarily indicating a chemical attack.

NEW TEST PROCEDURE

From our own experience and from the results of previous methods, it seemed obvious that no one single test so far considered was a good measure of the chemical resistance of a plastic. Therefore, we considered the use of not one but four such tests, all of which must be considered together to arrive at a conclusion. Our previous results showed that appearance of the sample was an important factor. It was included as one test. Weight changes would be important if excessive or if accompanied by severe swelling, so that was included. Volume changes were obviously important if considered in the light of weight and appearance changes, and so the third test was change in volume. The fourth test was the change in appearance of the solution-either discoloration or the appearance of cloudiness or sediment. This was included because if discoloration is very severe it may mean an actual peptization of the resin. At any rate, in cases where there is severe attack discoloration is usually present to a greater or lesser

These four tests then, run and considered together, form the basis of our new test procedure. Because we must now consider the appearance of each individual solution, it becomes necessary to have each sample in an individual container, as specified in the detailed procedure given in the panel, page 99.

With regard to the length of time samples should be kept immersed in the solutions before the test is considered completed, the longer the period the more reliable the results. A period of 3 months has been found to be enough for most Haveg tests. After that period, there seems to be

very little further effect.

The temperature of testing is likewise a matter of individual judgment. We have found it convenient to run our tests on Haveg at room temperature, at 50 deg. C. and at 100 deg. C., except in cases where the volatility of the solvent prevents use of the higher temperatures. It is not advisable to let these test tubes develop much pressure. Otherwise, in view of the resistance of Haveg up to 135 deg. C. and higher, tests at higher temperatures are perfectly possible.

INTERPRETATION OF RESULTS

The above tests will yield the following information on each sample; (1) Changes of appearance of the solution, (2) changes in appearance of the sample, (3) changes in weight of the sample, (4) changes in volume of the sample.

In order to eliminate the human element as far as possible and in order to provide a quantitative or semi-quantitative system of reporting results, a system of "ratings" on a percentage basis has been worked out for Haveg for each of the above test results.

This system of ratings is based on our experience with Haveg only and on our judgment of the importance of each particular result for the evaluation of this material. The result is that Haveg grades which are highly satisfactory in the field get a high rating, whereas those that show eyidence of attack receive a low rating.

The ratings are numerically on a percentage basis and the final rating depends on the average of the four individual ratings. Now as explained above, it might be possible to make a mistake or to misinterpret any one individual test, but hardly several tests. Therefore, with a "passing" mark of 75, it would be next to impossible for a sample to be accepted if it failed completely in a given test, but it could be rated fairly severely in one or even two tests and still be reasonably acceptable. Furthermore, no sample could achieve a high grade unless it was close to perfect in all four tests.

The rating system is, therefore, the

heart of our method of test. Admittedly, the establishment of such a system requires considerable experience and mature judgment to interpret field results and to bring them into full accordance with the laboratory. Once the system of rating had been satisfactorily established, however, we have found that it can be used safely by anyone of reasonable technical training. The results of different workers can be compared with at least approximate accuracy, and field results can be predicted with considerable certainty.

It should again be emphasized that the rating system which we have developed for Haveg and which will be discussed below, is correct for only this material in its different variations. Anyone using the general method for some other material would have to alter the rating system somewhat to take into account the specific needs of the material and its uses. We believe, however, that the method is more adaptable to all plastic materials than are the other methods discussed

RATING SYSTEM FOR HAVEG.

The ratings are divided into four groups as discussed before. Each one will be considered in order.

1. Appearance of Solution-Two kinds of things may happen to the solution. One is a change in color, usually a vellowing of the solution. Now under the conditions of the test, a vellow color can be produced which is not serious. In practice, it will probably mean that the first time a piece of Haveg equipment is used in that solution, the liquid might be discolored, but that with subsequent use the discoloration would disappear. This is a fairly common occurrence in fact. However, a strong red or brown coloration almost always means positive solvent action on the resin; it is rated very severely.

The other thing which may happen to the solution is the appearance of cloudiness or sediment. If there is more than a little of this, it indicates that something must have been dissolved and later precipitated. It is rated quite severely. Also the sample may have been more or less disinte-

grated.

This test can be made more accurate by providing color standards and sediment standards for comparison. With little experience, however, the ratings are fairly accurate without the use of such standards, and in most cases we believe them to be unnecessary. If the solution possesses a natural color, as for instance ferric chloride, potassium permanganate or the

like, a comparison with a sample of the original solution will be helpful.

2. Appearance of Sample-The changes in appearance of the samples are rated as shown in the panel. It may occasionally happen that the appearance of the sample does not correspond exactly to the schedule given there. In such cases, personal judgment must be exercised. But the rating table takes care of the vast majority of cases; it reduces personal judgment to a minimum.

3. Changes in Weight-As explained above, Haveg samples may gain or lose several percent of moisture quite independent of any effect of the chemicals. To take this into account, the chart which gives ratings for various weight changes, gives a 100 percent rating to samples that lose only 2-4 percent of their original weight. Weight increases up to about 12-14 percent are also rated fairly leniently, as they represent absorption of moisture or solvents which may be entirely harmless unless other tests indicate trouble. Above 14 percent. however, weight increases are pretty sure to represent solvent action, and the rating becomes increasingly severe. going to zero at 30 percent.

Losses in weight greater than 2 percent on dry or properly conditioned samples are almost certain to result from chemical attack of a definitely degrading nature. They are, therefore, very much more severely rated than gains in weight, and become zero at losses of only 10 percent.

The chart as given provides a means to obtain the weight rating directly. but if the chart should not be available, the ratings may be calculated from the following formulas: (1) For weight changes from -10 to -2 percent. R = 12.5W + 125. (2) From -2 percent to 0, R = 100. (3) From 0 to 30 percent, $100 - R = W^4 / 270$. (W is weight change and R is the rating; both are in percent.)

4. Changes in Volume-The other chart gives the ratings for various percentages of shrinkage or swelling. Like the chart for weight changes, it rates decreases much more seriously than increases, because shrinkage of any substantial amount is almost sure to

be actual degradation.

Swelling, however, is rated far more severely than is an increase in weight, because swelling is a direct measure of solvent action, whereas weight may not be. A small amount of swelling, to be sure, is of no very great importance, but if it becomes great enough it indicates very definite damage and warrants a rather severe rating-

In the absence of the chart, the following formulas can be used: (1) For volume changes from -10 percent to 0, R=10V+100. (2) From 0 to 30 percent $R^s=-333.2$ (V=30). (Where V is volume change and R is the rating, both in percent.)

OVER-ALL RATING

When all four ratings are obtained as described above, they are averaged, and one percentage figure or rating is obtained, giving the value of the sample under the test conditions. In many cases it is left in the form of a percentage, and as such permits a quantitative comparison between different grades, conditions or whatever. It may be argued, though, that the test is not precise enough for such very close comparisons, and that a semi-quantitative comparison is all that is justified. For this reason, we frequently report the results as excellent, good, fair or poor (see panel on page 98).

TEST CHECKS WITH FIELD

Before any such test method we have described here can be used for prediction of field results, it must be very fully checked and "calibrated" against known results. Accordingly we checked Haveg against several chemicals by this method, some of them known to be satisfactory in years of field service, some of them borderline cases, and a few that were known to be unsatisfactory in the field.

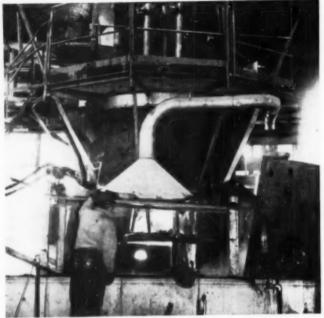
In doing this we selected for comparison Haveg-41 a standard acidresisting grade molded from phenolic resin and special acid-washed asbestos, and Haveg-60, a newer grade resistant to alkalis as well as acids, and based on furan type of resin made from

furfuryl alcohol.

The chemicals, as can be seen from the table of test results, included 35 and 20 percent HC1, 50 percent H₂SO₄, glacial acetic acid, sodium hydroxide, and 5 percent HNOs. By comparison of the last two columns, field results and general test results, it is apparent that a very close concordance exists between the laboratory and the field results. To be sure, there are a few minor discrepancies, where for instance the results at 50 deg. appear superior to those at 25 deg., but these do not affect the picture as a

The really rather surprising agreement obtained gives us the confidence to extrapolate this test, and use it directly to predict field results in cases where full experience is lacking.

The authors wish to thank Mrs. Grace Milbourne and Mr. Robert W. Laird for their valuable assistance in the work reported above.



MELTING of phosphate rock and olivine is done in converted steel-melting furnace; uses 850 kwls, per ton of product. Note round tap hole just above quenching trough.



QUENCHING must be immediate and intense to prevent phosphate reversion to insoluble form. As melt pours from furnace (top stream from left) it is blasted by water jets.

Process is practical in areas where power is cheap, and where olivine and phosphate rock are plentiful. This new Seattle plant is the only one of its kind in operation.

Electric

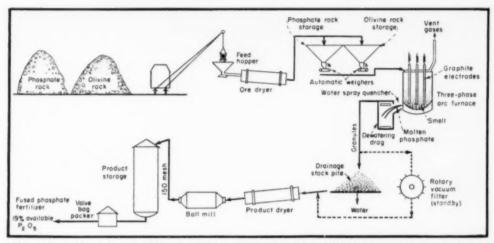
B. W. MOULTON

A fused phosphate fertilizer is now being produced on a commercial scale by Manganese Products, Inc., at Seattle, Wash. The plant is one of the two of its kind in the United States; it is the only one now in operation. The product, which is calcium magnesium phosphate from olivine-phosphate rock fusion, promises to be of great importance to Pacific Northwest agriculture; both the operation and the product are particularly suited to Northwest conditions.

THE BEGINNINGS

It was in 1943 that Walthall and Bridger of the Tennessee Valley Authority first reported results of work on the production of a phosphate-type fertilizer by the electric are furnace fusion of olivine (a natural magnesium-iron silicate) and phosphate rock. Their work was on a small scale but results were quite favorable. This soon led to a cooperative research program between Manganese Products, Inc., of Seattle and the chemical engineering department of the University of Washington. After laboratory work had confirmed the previously reported results, a pilot plant furnace of 200

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Melting and quenching are key steps. Melting, with olivine, puts phosphate rock in soluble form. Quenching keeps it that way.

Furnace Fertilizer: Ca-Mg-Phosphate

kva, capacity was built and operated for about six months. This furnace had an output of about six tons of product daily. Various raw materials were tested, and work was done on evaluating electrode consumption, power requirements, fluorine losses and other factors. Techniques for furnace operation and product quenching were worked out.

Commercial facilities were then installed in a plant at Seattle, and full-scale operations began in early 1948. Initial capacity has been about 50 tons of fused phosphate fertilizer each 24 hr. The product is distributed throughout the Pacific Northwest, but estimated phosphate requirements of this area far exceed the present plant capacity. Plans are well under way to expand output to about 150,000 tons annually by installing a second and larger furnace.

The Pacific Northwest has all the necessary raw materials for making this new type fertilizer. Phosphate rock is obtained from large deposits in western Montana; high-grade olivine rock is available in almost unlimited quantities in western Washington. Electric energy rates are favorable. A market exists in the area for substantial tonnages of phosphate fertilizer, but no superphosphate (and little sulphuric acid) is being made in either Washington or Oregon. All these factors combine to make the economics

of this process and product especially suitable for the region.

It is felt that such conditions—as well as the specific properties and advantages of the product that will be outlined below—will give rise to a wider use of calcium magnesium phosphate as a fertilizer material. Even now, studies are under way to build a similar plant in the Madras province of India.

Serpentine (a hydrous magnesium silicate) can be used as a raw material in place of iron-containing olivine. However, this mineral's water of hydration makes it less satisfactory for two reasons: (1) power and electrode consumption are somewhat higher; (2) there is more gassing during furnace operations.

TWO RAW MATERIALS

The fusion process requires two raw materials: phosphate rock and olivine rock. Phosphate comes from the company's own mine near Phillipsburg, Mont., where it is crushed to -1.5 in, and shipped to Seattle by rail. The mines are operated on a year-round basis. The rock analyzes about 30-32 percent P₂O₃.

High-grade olivine comes from company properties on Cypress Island, near Anacortes, Wash. This island is largely olivine, the reserves being estimated to be more than 50,000,000 tons. The ore contains about 8 per-

cent iron as Fe_iO_n . The olivine is crushed to -1.5 in. at the quarry and brought to the processing plant by

During rainy seasons of the year it is necessary to dry the raw materials before charging them to the furnace; otherwise their high moisture content causes excessive power and electrode consumption. This drying is done by means of an oil-fired rotary dryer with a capacity of about 5 tons per hr.

Raw materials from the storage bunkers are automatically weighed in a 2:1 ratio of phosphate to olivine and carried by a 20-in. conveyor belt to the 2.5-ton furnace hopper. Charging may be continuous or intermittent, depending on the operation.

THE TUSION FURNACE

This unit is a three-phase Greene electric are steel melting furnace that has been modified specifically for this fusion process. The changes necessary to adapt this furnace to phosphate smelting were: (1) the tilting mechanism was removed and the furnace mounted so that it was fixed in position; (2) the lining was replaced, as described later; (3) the height was increased from 5 ft. to 10 ft., the diameter of the shell being 8 ft. and the inside of the lining about 5 ft. 8 in.; (4) the tap hole was redesigned. These changes allowed the use of the same electrode clamps and feed mechanism and have resulted in satisfactory furnace operation.

The furnace has a 14-in, concrete cover with one opening for the rock, another for the stack and a third for inspection. It uses three 6-in, graphite electrodes with water-cooled clamps and rings. These electrodes are consumed at the rate of about 15 lb, per ton of rock. The plant has a 2,500 kva, transformer, but the present three-phase furnace uses only about 60 percent of its capacity, operating at 5,000 amp, and 180 v.

At present, the furnace lining consists of rammed carbon paste in the bottom which extends up a slight distance along the furnace wall. That part of the wall which is in contact with the molten slag is not lined with any refractory: the fusion reaction is corrosive to most commercial refractories now on the market. Instead, a water jacket on the outside of the shell at this point keeps the wall cold and freezes a thin layer of slag against the inner wall. Above the molten slag zone, the furnace is lined with conventional firebrick 4.5 in. thick. This lining set-up has given the most satisfactory type of operation.

Crushed and dried feed is charged continuously to the furnace and distributed uniformly around its electrodes; in this position it tends to condense ascending vapors. The furnace has a capacity of 10 tons of cold feed but is operated only 50-65 percent full; experience has shown that otherwise pockets of H_e.CO.CO₂ and other gases tend to form. The smelting zone at the bottom of the furnace is only a small fraction of the unit's total volume; operating temperature in this zone is about 1.500-1.600 deg. C. The fusion time is 1 to 2 br.

Ratio of phosphate rock to olivine in the feed is 2:1 but this will vary slightly with the chemical analysis of the raw materials. One ton of rock charge produces 0.90-0.95 ton of phosphate fertilizer. Practically all of the P.O. charge appears in the final prodnct, but a considerable part of the iron in the olivine is reduced to metallic iron; this is tapped out at a lower hole. About 80-90 percent of the fluorine in the phosphate rock remains in the product. The vent gases consist of water vapor, H,N,O,CO,CO, and some fluorine compounds, probably HF and H₂SiF₆. Energy consumption in the furnace is about \$50 kwh. per ton of product.

TAPPING AND QUENCHING

The fused product is tapped from the furnace intermittently with about 5 min, between each 30-min, tapping. The stream of molten phosphate slag is quenched quickly by pelting with a high-velocity spray of cold water from 11 jets operated under 70-100 lb. pressure. The spray comes from two directions, above and below the molten stream and at right angles to it. Proper quenching is one of the most important steps in the process; slow cooling of the slag will result in reversion of the phosphate to an insoluble form that is not satisfactory as a fertilizer ingredient.

Quenched product—in the form of spherical and glassy olive-green granules—falls into a water quenching tank that is 30 ft. long and rises some 9 ft. at one end. Angle irons on a traveling conveyor chain scrape the granules from the bottom of the quencher and up the incline, draining off some of the water. The product is dumped on a wire mesh conveyor belt which takes it to a large stock pile; here it remains for 5-10 days. This storage allows most of the water to drain from the product; vacuum filtration therefore is not necessary. The drained material goes to the dryer.

This is an oil-fired rotary unit which lowers the moisture content to less than one percent. The semi-frable product is then ground to about 150 mesh in a ball mill with a capacity of 5 tons per lir. Before grinding, the particle size averages about 20 mesh.

The ground material is next elevated from the product storages to the valve bag packer for final packaging. Most of the plant's output is sacked in 100-lb. paper bags. It does not attack the bags, since no curing is required, the product is ready for immediate shipping.

WHAT'S THE PRODUCT LIKE?

Commercial calcium magnesium phosphate made by the furnace fusion process is comparable in plant food value to single superphosphate, yet it is different in a number of important respects. Its physical properties can be summarized by these adjectives: gray, granular, dense, odorless, free-flowing, non-hygroscopie, non-caking, non-corrosive.

Some of these properties are reflected back into definite advantages in the handling and application of the product. Its granular and free-flowing nature makes it easy to handle. Since it is non-hygroscopic, it does not cake on storage either in bulk or in bags. Then density of the product is appreciably greater than superphosphate for this reason less storage space is required for a given tonnage of material. Approximate density of the fused product is 100-110 lb. per cu.ft. When it is finely ground, which is necessary for maximum availability of the phosphate.

phorus as a plant food, it can be scattered by stiff breezes; but this can be avoided by proper handling.

Calcium magnesium phosphate does not rot bags of any type—a property appreciated by farmers and fertilizer dealers. Unlike superphosphate, it does not require a curing period, can be bagged and shipped as soon as it is made—a characteristic that lowers plant handling costs and eliminates the need for large curing sheds.

Chemically, the product differs from superphosphate in several ways (see table). It analyzes at least 19 percent soluble phosphate (standard AOAC neutral ammonium citrate method) as compared to 16-19 percent for superphosphate. Its magnesium content, as MgO, is about 14 percent; the total and acid-soluble MgO values are practically identical. As could be expected, its SiO₂ content is high—about 23 percent.

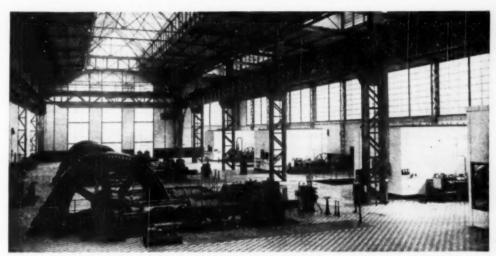
In one important respect, fused phosphate is different from superphosphate: it is non-acid in reaction. In fact, one ton of fused phosphate is equivalent to 1,200 lb. of limestone for soil sweetening. For this reason, it is hoped that the product may receive a premium government subsidy payment in the state of Washington.

The high soil-sweetening value of calcium magnesium phosphate makes it particularly suitable for use on acid soils. It is also suitable for neutral or slightly alkaline soils, but the plant response is naturally somewhat slower. Its high MgO content makes it especially valuable for magnesium-deficient soils such as occur in the rain belt of the Pacific Northwest and in other areas of the United States. Since it has a higher available P.O. than superphosphate, it will receive a higher subsidy payment in Washington. Plant response to the product has been very satisfactory, and the material is rapidly growing in favor with Northwest farmers.

Typical Analysis of Fused Phosphate Fertilizer

w constant	
Maior Elements P.O., total P.O. available CaO. MaO. SiO ₂ . F. R ₂ O ₁	19.0 Guar.* 29.0 Guar.* 14.0 Guar.* 23.0
Trace Elements! Mn0 Von Von Cu0 Tro Zn0 N0 Sn0 Sn0 Sn0 Sn0 Na0 Sn0 Kn0 Rn0 Rn0 Rn0 Rn0 Rn0 Rn0 Rn0 Rn0 Rn0 R	0.04 0.15 0.01 0.15 0.03 0.08 0.30 0.30

*Guaranteed; neutral ammonium citrate methos for PrOs. †Approximate; by spectroscopic analysis.



Air Liquide hydrogen plant at Rauxel, Germany, comprising three units of 7,000 cfm. coke-oven capacity each.

Liquefaction for Separating Hydrogen From Coke-Oven Gas

Hydrogen has been separated extensively from coke-oven gas in Europe by liquefaction techniques, but the process is virtually unused in the United States. Other gases can also be recovered in this way

PIERRE GUILLAUMERON

Hydrogen separation from industrial gases by the liquefaction process was developed first in France and Germany. In 1900 Professor d'Arsonval extracted hydrogen from city gas flowing through a coil cooled by liquid air in an experimental apparatus. Georges Claude took out the first patent for a process and a separation apparatus operating on industrial gases-especially water gas. A few years later, the German, Carl von Linde, took out a patent on his methods and technique. The previous work of these scientists on liquid air, and their wide experience on gas liquefaction in general, enabled

PIERRE GUILLAUMERON is an engineer with L'Aire Liquide Co., Paris, France. Well known on this continent, he was for a time chief engineer of the Canadian Liquid Air Co., Ltd., Montreal, Canada. them to tackle this important industrial problem successfully.

Both inventors had built units for acronauties and for oil hydrogenation when World War I interrupted their work. Although the earlier patents were not limited to the use of water gas, Bronn referred in 1914 specifically to coke-oven gas as a hydrogen source for ammonia synthesis." The world had slowed up research in this field, because of the development of the socalled "conversion process" allied to the Haber-Bosch ammonia synthesis on which, at least in Germany, all the research had been concentrated. Finally, in 1922, Claude, who in this interval had worked out his high pressure ammonia synthesis process, succeeded in operating the first industrial unit for hydrogen production using coke-oven gas as raw material. This unit was located at the Bully plant of

the Compagnie des Mines de Béthune, in France.

The problem of shifting from water gas to coke-oven gas liquefaction was not simple. Coke-oven gas is abundant and cheap. However, although technical men were well aware of its chemical potentialities, its complexity was a not inconsiderable stumbling block. The credit for the successful solution of the problem must be shared between Claude and his coworkers headed by Henri Lantz and Pierre Schideler.

Following the developments of Claude and his associates, Linde and Messer, in Germany, developed their solutions to the problem and from 1922 until 1939 a large number of liquefaction units mushroomed near the coke-oven plants of Europe and Asia. Prior to the second World War, over 30 percent of the hydrogen for

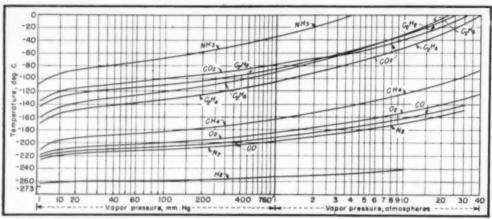


Fig. 1-Vapor pressures of coke-oven gas components, left half in mm. Hg and right half in atm.

the synthetic ammonia industry in Europe came from coke-oven gas separation. The installed capacity had reached 2,500 tons per day.

To a casual observer it is certainly striking that this process did not develop in the United States. The reason may be found in the use of other sources for hydrogen manufacture. well adapted to large scale production. like water gas or natural gas. However, there is no doubt that on many of the hundred odd existing cokeoven installations, liquefaction could be applied to great advantage.

The principles of low temperature technique, already familiar to the oxygen and rare gas manufacturer, are basically applicable to coke-oven gas, and a better comprehension of the problem should certainly extend the

application.

HYDROGEN SEPARATION CONDITIONS

Coke-oven gas is a complex mixture. Its analysis depends on the composition of coal and on the conditions of carbonization. The present trend towards low temperature carbonization, for instance, favors the formation of hydrocarbons and lowers the hydrogen content. In general, the average volumetric analysis of the gas leaving the coke plant ranges between the limits shown in Table I.

Table I-Average Volumetric Analysis of Coke-Oven Gos.

	l'ercent
	Range
Hydrogen	47-60
Methane	20-30
Nitrogen	5-15
Carbon monoxide	8-7
Carbon dioxide	1.3-3.0
Ethylene	1.2-3.0
Ethane	1-2
Oxygen	0.1-0.8

To these gases must be added lesser amounts of propane, propylene, butane, butylene, acetylene, benzene and light oils, naphthalene, hydrocyanic acid, nitrous oxide, hydrogen sulphide. carbon bisulphide, carbon oxysulphide. mercaptans, etc.

The boiling points of these components at atmospheric pressure are given in Table II. Fig. I shows the vapor pressures of the various components of coke-oven gas plotted against temperature. The left-hand portion of the chart shows pressures in millimeters Hg, the right-hand portion in atmospheres.4

Table II-Boiling Points of Coke-Oven Components at 760 Mm. Hg.

	Degrees (
Hydrogen	-252
Nitrogen	-196
Carbon monoxide	-191
Oxygen	-183
Methane	-161
Ethylene	-104
Ethane	- 89
l'repylene	-48
Propane	- 42

It would appear from these data that the separation of hydrogen requires only a limited lowering of temperature as its liquefaction point is widely separated from those of the other components. The problem is actually more difficult because condensation is spread over a long temperature range with resulting lower partial pressure of each component."

This difficulty can best be illustrated by considering the simple problem of separation of carbon monoxide from hydrogen in water gas, which was investigated by earlier workers. The liquefaction of the last traces of CO is possible only at a temperature much

lower than -191 deg. C., its boiling point at atmospheric pressure. If we consider 1 mol of water gas containing 60 percent H2 and 40 percent CO. the mol fraction Co of carbon monoxide condensed at a given temperature T and pressure P is easily determined. According to the general laws for gases. still assumed applicable in the vapor phase, the ratio of uncondensed carbon monoxide to hydrogen is equal to the ratio of the partial pressures of these gases, Pcu and (P - Pco), respectively:

$$\begin{array}{ll} \text{then} & \frac{0.4 - C_{C0}}{0.6} = \frac{P_{C0}}{P - P_{C0}} \\ \\ \text{or} & C_{C0} = 0.4 - \frac{0.6 \; P_{C0}}{P - P_{C0}} \end{array}$$

The value of P_{co} varies as a function of temperature according to curves in

Using this relation and assuming an operating pressure of 20 atm., the variation of Co and the percentage of CO remaining in the gas (i.e., uncondensed) has been calculated and the results shown on the curves in Fig.

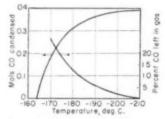


Fig. 2-Mols CO condensed from water gas (60 percent H, and 40 percent CO) at 20 atm. and various temperatures.

2. The Coo curve rises sharply at first and then flattens out with only slight changes in its value for large variations in temperature. At -191 deg. C., 0.368 mols is condensed, which leaves (0.4 - 0.368)/(1 - 0.368) or 5 percent in the gas. At -210 deg. C., which is the minimum temperature generally reached at the discharge end of the expansion engine in the Claude cycle, there is 0.3 percent CO left in the gas. This is not a negligible amount when considering most synthesis processes.

A similar calculation can be made with coke-oven gas, the composition of the final mixture, carbon monoxide and nitrogen, rendering this calculation more complex. As a result, the first simple liquefaction units built produced hydrogen with a CO content of 2 to 3 percent. When the hydrogen was used in the Claude ammonia synthesis, the presence of this quantity of CO was not detrimental as it was converted to methane prior to the NH, synthesis converter. Methane. inert to the catalyst, affected only the partial pressure of the reacting nitrogen and hydrogen, a minor drawback at 15,000 psi. pressure. However, this methane had to be purged from the circuit and purging losses affect the cost. Therefore, a higher purity hydrogen is preferable; also other ammonia synthesis processes require a much purer gas. To meet these conditions the liquefaction process was modified and special methods, which will be described later, were developed to reduce the CO content.

PRE-TREATMENT OF COKE-OVEN GAS

Before going into the details of the liquefaction units, some consideration should be given to the treatment necessary for the coke-oven gas coming directly from the plant. As mentioned above, the gas contains small amounts of high boiling compounds, such as tar, oil, benzene, etc., and if the gas were turned into the liquefaction apparatus in the condition as received from the coke ovens, these higher boiling compounds would freeze in the apparatus and soon ren-der it inoperable. For this reason, extensive purification is necessary befor the gas can enter the liquefaction apparatus. In addition, many of these products are of economic value and can be recovered at some profit. The crude gas is passed through primary condensers, exhausters and extracters to remove the tar. Ammonia is absorbed in a sulphuric acid saturator or a water scrubber, naphthalene is separated in the final coolers and most of the light oils in absorption towers.

Carbon dioxide and other impuri-The purification pressure is deter-

ties still have to be removed to avoid their freezing and clogging the lique-faction unit. They could be scrubbed out under pressure with water but this process is uneconomic because of the small percentage involved in the cokeoven gas. In fact, absorption by water is almost independent of the CO, content, as the solubility of the gas is proportional to its partial pressure. Otherwise, water scrubbing is justified for higher CO₁ percentages as met with in converted water gas, for example. A chemical process, where the consumption of product is proportional to CO, is cheaper. It has also the advantage of decreasing the solubility losses of the constituents of coke-oven gas, which may exceed 4 percent with water scrubbing. Furthermore, ethylene, a valuable raw material for organic synthesis and fairly soluble in water, is saved.

Ethanolamines have been recommended for chemical decarbonating. In Europe ammonia liquor is generally used. It retains hydrogen sulphide and hydrogen cyanide as well as CO2 and the liquor is easily regenerated by steam heating. Great care must be used in the choice of the materials for the regeneration equipment because of the strong corrosive action of the complex hot carbonated liquor. Cast iron and aluminum are resistant to its action. The ammonia fumes carried away after the decarbonating tower are absorbed in a small water scrubber, with the last traces of CO₂ (0.01 to 0.02 percent) absorbed in a caustic solution.

The presence of nitrous oxides in the purified coke-oven gas was pointed out first by the French in 1924." Nitrous oxides are not dangerous by themselves, but they combine easily in the liquefaction apparatus with polyethylenic hydrocarbons to give unstable gummy mixtures and com-pounds. They are now usually destroved before entering the apparatus, in a section of the ammonia decarbonating tower filled up with iron Raschig rings. The gases, at 40 deg. C., react with ammonium carbamate and iron sulphide and are decomposed into N. and H₂O. Sometimes, the reaction of nitrous oxides and polyethylenes takes place in a vessel following the compressor, where the temperature is maintained at 100 deg. C.; the gums deposit or are carried away in the scrubbers.

A typical train of purification scrubbers comprises the following towers: (1) two for ammonia liquor, in series; (2) one for water; (3) optionally, one for light oil; and (4) one for caustic soda solution.

mined by the operating pressure of the liquefaction column. It varies according to the type of column used and its capacity, normally being between 10 and 20 atm.

A desiccating apparatus was used in some plants. At present, however, moisture is effectively removed in the first part of the liquefaction unit itself. In other plants a water scrubber ahead of the set removes the dust and tar; a weak sodium carbonate solution is still better as it simultaneously absorbs any corrosive hydrogen cyanide.

LIQUEFACTION APPARATUS

Modern liquefaction equipment for handling coke-oven gas is quite complex in detail, especially if complete separation of all components is desired. However, there are basic parts common to all systems, and the complexity of the apparatus results from modifications and additions in order to improve the operating characteristics.

We will therefore start by examining the first type of coke-oven liquefaction unit as designed by Claude in 1921. It is shown diagrammatically in Fig. 3. It consists essentially of two exchangers in series, a vaporizer and an expansion engine. Coke-oven gas, leaving the purification train at a pressure of 30 atm. (since much reduced), enters the heat exchangers which are of the copper tube-nest type. The incoming gas circulates outside the vertical tubes, directed by horizontal baffles, and is cooled by the outgoing gases, hydrogen in one group of tubes, a mixture of CH, CO and N, called "rich gas" in a second, and ethylene in a third. Ethylene is liquefied in the second exchanger and collected in a series of horizontal travs. The gas then enters the vaporizer column at a temperature of -155 deg. C.

This piece of equipment is made of a nest of tubes, divided in the middle by a special section. The bottom part of the vaporizer condenses mostly methane; the top part, carbon monoxide and nitrogen. The condensed liquids are expanded to almost atmospheric pressure in the space surrounding the tubes of their respective sections, reducing the temperature of each. For example, the vaporization of methane by the ascending gases releases a large amount of refrigeration and the temperature drops below -165 deg. C.

The gas leaving the top of the col-umn is expanded through an expansion engine with performance of external work, bringing its temperature down from -185 deg. to -200 deg. C. This cold gas is used for further cooling of the top section.

Finally, the apparatus yields a

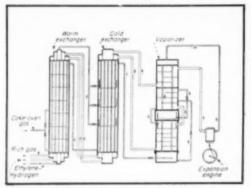


Fig. 3-Diagram of first coke-oven gas liquefaction set-up.

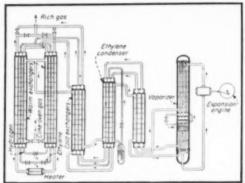


Fig. 4-Air Liquide liquefaction unit (low pressure H_s).

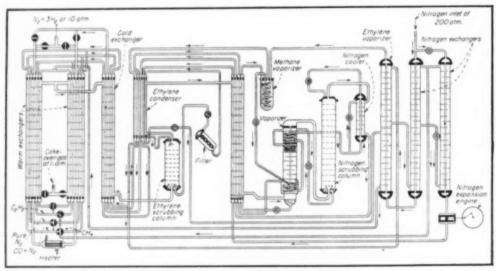


Fig. 5-Diagram of Air Liquide liquefaction set-up with nitrogen refrigeration cycle.

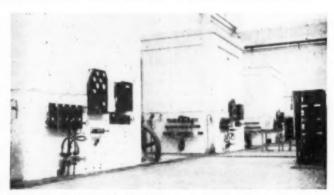


Fig. 6-Close-up of one of the liquefaction units at Rauxel, Germany.

stream of hydrogen containing 2 to 3 percent CO, 12 to 15 percent N₂ and a stream of "rich gas." This rich gas is of a high calorife value (600 Btu. per cu. ft. or more) and is quite suitable for heating the coke ovens.

Since their original conception, many improvements have been brought to such liquefaction units with the result of lowering the operating pressure to 12-15 atm. for large size units. The most characteristic part of the apparatus, the expansion engine, has followed the improvements of the corresponding machine in the

EXPANSION ENGINES

It should be recalled that this engine furnishes the additional refriger-

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ation necessary to compensate for the losses from two sources: (1) radiation due to imperfection of insulation (about 2 percent of the total refrigeration); and (2) losses at the warm end of the exchanger, the difference of temperature between incoming and outgoing gases reaching 6 to 7 deg. C. As opposed to air liquefaction apparatus, where the refrigerating effect can be obtained by expansion through a nozzle, here there is a negative Joule-Thomson coefficient for hydrogen, and expansion with performance of external work is the only way to reach a lower temperature if an independent refrigerating agent is not used.

DIFFICULTIES SOLVED

The functioning of such an engine without the usual lubrication between piston and cylinder was much criticized during the initial development. The difficulty has been solved by using leather cup pistons and highly polished cylinders. In the first plants, Claude used petroleum ether as a lubricant during the starting period, and then liquid nitrogen. It was found out later that the expanding gases were carrying enough nitrogen to insure sufficient lubrication. At present, the maintenance of the expansion engine is no problem at all and the latest type. horizontal instead of vertical, works with a smoothness comparable to any other ordinary temperature engine. and with complete safety of operation. The development and use of the compound type of expansion engine has resulted in increased efficiency. In large units a turbine can also be used to advantage instead of a reciprocating machine.

In the liquefaction apparatus itself, many improvements have been necessary to avoid interruption in operation caused by small traces of the higher boiling constituents which were not completely removed in pre-treatment.

Water vapor was first removed in batteries charged with lumps of caustic soda; however, its partial pressure was still sufficient to block the exchangers after a few days' run. These dryers have been replaced by complete refrigeration desiccation in the first heat exchanger. For this purpose, the compressed gas circulates in the first or 'warm" exchanger from bottom to top; water progressively condenses and runs along the warmer parts of the tubes down to the bottom pot from which it is purged. Benzene, or rather a mixture of benzene and Co and C, hydrocarbons, condenses with the water. Its vapor pressure still causes ice formation in the higher portion of the exchanger and it is therefore necessary to remove the ice ("de-

frosting"), first by shifting the room temperature gas at regular intervals and for a few minutes from the bottom to the middle of the heat exchanger. A more efficient method is to provide two "warm" exchangers used alternately when the pressure drop or the temperature difference at the warm end becomes too large. The double warm exchangers are illustrated on Fig. 4. Benzene, which may amount to 2 to 4 grains per cu. ft, in the entering gas, is recovered and separated from the water. At the top of the warm exchanger, where the temperature reaches -70 to -80 deg. C., all traces of water and benzene are completely removed. In the following or 'cold" exchanger, which is of similar construction, olefins like propylene are condensed with various Ca and Ca hydrocarbons as the temperature is lowered to -115 deg. C.

Acetylene, as well as nitrous oxides mentioned above, caused many difficulties in the first plants, where explosions could occur during liquefaction processes. The explosive character of liquid acetylene is well known. Its content, 150 to 500 ppm., is sufficient to block the liquefaction apparatus beyond the second exchanger. Fortunately, the amount is generally proportional (1/50 to 1/100) to the quantity of ethylene in the coke-oven gas and it is miscible in this ethylene. It also forms azeotropic mixtures with liquid ethane and ethylene of a lower boiling point than the three components. Therefore, a special third exchanger or ethylene condenser (as in Fig. 4) is generally provided with temperature ranging from -115 to -140 deg. C. In this exchanger the ascending compressed gas meets the reflux of ethylenic liquid on baffles. The acetvlene is thus completely removed by dissolving in the liquid ethylene.

The liquid ethylene fraction leaving the third exchanger contains ethanc, higher C₃ and C₄ homologues, and some liquid methane; this liquid mixture is collected in a receiver. It is sent from the receiver through a valve and then back through to the central tube nest of the exchangers, providing part of the refrigeration for the incoming coke-oven gas, before leaving the unit. It may contain up to 30 to 40 percent ethylenie hydrocarbons. For higher purity, it is necessary to use a special rectification column, since the boiling points of ethane and ethylene differ only by 15 deg. C. and the formation of the azeotropic mixture with acetvlene complicates the separation. Sometimes another heat exchanger is provided after the ethylene separation, where methane starts liquefying down to -170 deg. C.

The gas passes then to the vaporizer already described. Its expansion, after leaving the vaporizer at -185 to -195 deg. C., cannot be very efficient. In fact, for perfect gases, expansion work decreases with temperature, becoming nil at 0 deg. K. With gas containing nitrogen close to its liquefaction point, the performance would be poor. The same problem is met in air liquefaction' and it has been solved the same way by raising the temperature of the gas to be expanded.

The potential of this low temperature gas is not wasted; it is used to cool down the gas entering the bottom of the vaporizer. Of course, the large temperature head between in- and outgoing gases would lead to an increase in entropy of the whole system. To avoid this, Etienne designed a special vaporizer," consisting of a double nest of tubes, the cold gases warming up progressively in the inside tubes while the warm gases circulate in the opposite direction in the annular section (see Fig. 4). The process is then more reversible, with less waste of energy and hence a lower power input.

Since by far the largest number of these plants were developed for the ammonia synthesis industry, the presence of No is not objectionable. The hydrogen leaving the apparatus usually contains up to 10 percent N, and about 2 percent carbon monoxide. If purer hydrogen is desired, 95 to 97 percent H2 for instance, other improvements have to be made to the design. A compound type of expansion engine

may also be used.

NITROGEN SCRUBBING

When it is necessary to reduce the amount of carbon monoxide in the hydrogen product below 2 percent, liquefaction units are provided with special scrubbers. In most cases, where the final product is not affected by the presence of nitrogen, this gas is the ideal medium for removing the CO. as its boiling point is only slightly lower than that of CO, -196 against -191 deg. C.

The nitrogen scrubber in this type of plant consists essentially of a simple column provided with a large number of rectification travs, with 99.9 percent pure nitrogen, compressed to 20-30 atm., introduced into a nitrogen exchanger where it is cooled countercurrent to a portion of the carbon monoxide and methane coming from the vaporizer as described above. The nitrogen is further cooled to -150 deg. C. and liquefied by passing it through a series of coils which are immersed in some of the liquefied separation products. Finally, it is supercooled to -190 deg. C. and expanded

to 12-15 atm. through an expansion valve, then introduced to the top of the scrubbing column. The liquid nitrogen passes down this column countercurrent to the ascending hydrogen stream which contains about 2 percent CO and some CH. The liquid nitrogen containing all the impurities leaves the bottom of the column and after expansion to lower pressure is used throughout the unit to provide additional cooling for the incoming coke-oven gas and the incoming nitro-

The nitrogen scrubbing column is shown clearly in Fig. 5. This diagram refers to a slightly different type of plant which will be described in a further section, but the nitrogen scrubbing circuits are identical. The series of cooling coils are in the methane vaporizer and in the main vapor-

Assuming the small temperature differences between the travs of the scrubbing column are negligible, and equal amounts of liquid and vapor on each tray (latent heats of nitrogen and CO are almost identical), it is easy from the ternary equilibrium diagram CO-N_x-H₁ to compute the minimum amount of liquid to remove CO. In actual practice, this amount is about 10 percent of the coke-oven gas being treated. The liquid leaving the bottom of the scrubber contains up to 40 percent CO and the remnants of methane. Hydrogen at the top yields less than 10 ppm. CO; the nitrogen in it, about 10 percent, decreases with the operating pressure.

Liquefaction units similar to the type described have been built by L'Air Liquide to handle over 7,000 cfm. of coke-oven gas. The headpiece shows a general-view of a plant at Rauxel, Germany, which comprises three of these units with a total output of 10,000 cfm. of hydrogen. Fig. 6 is a close-up of one of the liquefaction

COMPRESSED HYDROGEN UNITS

When hydrogen has to be used under pressure, as is the case in ammonia synthesis, it is more economical to produce it under pressure by avoiding its expansion through the expansion engine. An auxiliary refrigeration circuit may then be used to advantage. The use of this system results in a final power saving of the order of 20

The refrigerant must have a lower boiling point than methane and carbon monoxide. Here again, nitrogen is ideal. The amount of this gas varies according to the composition of the coke-oven gas. By operating the nitrogen circuit under 200 atm. during

the starting period and at 140 atm. during normal running and with a proper circulation of gases, the necessary amount of nitrogen does not exceed 30 percent of the volume of a coke-oven gas containing initially 50

percent H.

The layout of a liquefaction unit with an external refrigerating circuit varies with each designer. The German technique is to precool nitrogen as well as the coke-oven gas to -40 deg. C. with an auxiliary ammonia refrigerating circuit. The precooled nitrogen at 200 atm. traverses the heat exchangers, is cooled by liquid methane at -165 deg. C. and expanded through a nozzle to the pressure of the rectification column, bringing its temperature down to -180 deg. C. Liquid nitrogen flows down into the CO scrubber and is later expanded to 1 atm. and vaporized. This low temperature gas is then used to cool the cokeoven gas and to condense CO and CH. Part of the nitrogen, after its first expansion and after giving up its refrigeration to the incoming gas, returns to the compressor inlet. The coke-oven and hydrogen circuit is at a pressure of 10-15 atm.

In the apparatus of a similar type designed and built by L'Air Liquide, the cumbersome ammonia refrigeration equipment has been eliminated and, in its place, a system of high-pressure nitrogen is used to provide both the refrigeration and the liquid nitrogen for scrubbing. A simplified diagram of a unit of this type is shown in

The coke-oven gas enters the apparatus at 10-15 atm. and, except for a drop in pressure through the apparatus, it leaves at essentially the same pressure. In the auxiliary nitrogen section the pure nitrogen is admitted to the apparatus at a pressure of 200 atm. Part of the nitrogen is passed to an exchanger and is expanded in a nitrogen expansion engine where the gas is cooled and provides refrigeration for the various parts in the coke-oven gas circuit. The remainder of the nitrogen is cooled partially by the outgoing methane product, and by the ethylene fraction. It is liquefied by passing through coils in liquid methane and nitrogen, and supercooled by hydrogen leaving the nitrogen scrubbing column. Part of this liquid is then used to scrub the carbon monoxide from the hydrogen fraction and part serves to adjust the hydrogen-nitrogen mixture to the desired stoichiometric composition, if the gas is required for ammonia synthesis.

In the compressed hydrogen apparatus, the separation of gases may be more complete than in the other units

previously described. By using a volume of nitrogen in the refrigeration circuit equal to 25 or 30 percent of the coke-oven gas, methane can be obtained at 80 percent purity. It is also possible to get a 30 to 40 percent ethylene mixture and a third gas con-sisting mainly of nitrogen (70 to 80 percent).

Variations are made in the above type of apparatus and the one previously described, such that hydrogen can be obtained with a purity of 99 percent, the balance being less than l percent nitrogen and 0.001 percent

carbon monoxide.

The power consumption for this type of plant is only 10 kwh. per 1,000 cu. ft. of N₂ + 3H₂ gas mixture compressed at 10 atm. The yield of the columns is the same as for the lowpressure hydrogen type, that is, 96 percent. These units operate continuously for over six months without requiring "defrosting" or shutdowns.

EXTENSION OF LIQUEFACTION UNITS

In general, the apparatus may be varied or combined to provide an additional rectification of ethylene or other fractions which may be desired. In fact, coke-oven gas separation is only a particular case of the general problem of gas separation by liquefaction, All hydrocarbon mixtures, and all residual gases containing hydrocarbons, can be handled by this method and separated to the required purity. The complexity of the rectification column depends on the degree of separation needed and on the purity of each component. The number of cycles involved may vary, being determined according to the nature of the raw material and the products desired and also by the purity of products that must be produced.

The author wishes to express his anpreciation for helpful suggestions and technical assistance to P. Hourlier, A. Etienne, H. Vesque and H. Bonnaud of Société L'Air Liquide, and to M. Jean of Société Chimique de la Grande Paroisse, who have been responsible for many of the developments described in this paper, as well as to J. T. Hugill of Canadian Liquid Air Co. Ltd., of Montreal, Canada, for a thorough revision of the text.

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Education for Nuclear Engineers

The country needs nuclear engineers. Nuclear engineers need specialized training. So university curriculums need revision.



Kenneth D. Nichols

In the early days of the Manhattan Project we recognized that our primary problems involved not only science but, even to a greater extent, engineering and industrial management. We recognized that we must see that the necessary research and development was completed, that orgamzations be obtained or built up to complete the design of the production plants necessary, to construct these plants and then to operate them for the production of plutonium and uranium 235. We also recognized that, in addition to research and development, a considerable amount of engineering was necessary if a practical homb were to be developed. scientists in the project at that time recognized the existence of typical engincering problems but few of them realized the complexity or the magnitude of the engineering that would have to be devoted to their solution

MAJOR GENERAL NICHOLS IS Chief of the Armed Forces Special Weapons Project, National Military Establishment. During the war he was district engineer, Manhattan Engineer District. This paper is based on a talk given by Maj. Gen. Nichols at West Point May 14, before the American Society for Engineering Education.

before the project could be accom-

". . . a physicist assumes that chemical engineering is so easy.'

The first problem we had was to select engineering contractors to design the production plants. Our first selection was Stone & Webster, Shortly after the selection of Stone & Webster it was obvious to us and to the physicists in Chicago that a great deal of chemical engineering had to be done if a chain reaction pile for production of plutonium were ever to be practical. In retrospect it has always amused me how a physicist assumes that chemical engineering is so easy. To a physicist it is a well-known fact that it is possible to separate two elements, so as far as they were con-cerned whenever you had two elements that had to be separated, just stating the problem was a major contribution toward the solution. Owing to the general nature of the early scientific work most of the laboratories were headed by physicists; as a result, we frequently found ourselves in difficulty with chemical engineering

Typical of this is the early tremendous under-estimating of the chemical problems associated with the plutonium project. As contracting officer I remember sitting down with the Chicago physicists, the micro-chemists who knew all there was to know about the chemistry of plutonium which had been derived from less than milligram lots, and with engineers from Du Pont.

The estimate at that point was that it might take a million dollars worth of plant to develop a practical semiworks for the chemical process. Du Pont, being a little more skeptical. thought two million might be a better estimate. Inasmuch as we had the money, I suggested we use three million as an estimate. One month later Du Pont was back on our necks. They had gotten into the problem enough by that time to realize that neither two nor three million would touch the problem. Not only that, they felt

the whole project needed a thorough engineering review to determine if the many engineering problems involved not only in the plutonium project, but also in the U-235 and the weapon development project, could be solved in a reasonable time.

As a result, a committee consisting essentially of engineers was set up to review the over-all proposal. This committee, which did its work between September and November 1942, outlined generally the basic engineering problems that had to be solved, made preliminary cost estimates that turned out to be reasonably accurate, and recommended the types of organizations that were necessary to design, construct and operate the plants involved in the Manhattan Project.

As a result of the findings of this committee we undertook to allocate the project organizationally and to contract with the research, engineering, construction and industrial organizations necessary for the complete project. Typical of the reactions of the companies selected was that of Du Pont when they were asked to take an over-all responsibility for the design, construction and operation of a plutonium production plant. I will always remember Dr. C. M. A. Stine's analysis of the situation when he and other members of the Du Pont company heard the report of the engineering committee, to determine whether or not to recommend that they accept their part of the project. At that time his opinion was that he foresaw no engineering problems involved in the production and separation of plutonium that could not be solved eventually by engineering and technical talent available to the Du Pont company and other industrial concerns in the United States. He questioned very seriously, however, whether the multitude of these problems could be solved successfully in time to be of use in World War II. However, he summed it up very neatly by saying that in view of the tremendous importance of the project and in spite of his pessimism he saw no alternative for the United States or for Du Pont than to go ahead with the project and try to solve them according to the schedule.

Other companies were selected for other parts of the project. On the uranium 235 end of the project the task involved engineering problems equally as difficult as did the plutonium project. Here again in the electromagnetic plant the fact that our laboratories were organized primarily to solve the problems in physics led to underestimating the chemical engineering involved. The basic scientific work on the physical separation of U-235 and 238 was extraordinarily well in hand, but the research on the supporting chemistry lagged behind. I well remember the days in the early production efforts of the electromagnetic plant when no matter how much material we put into the production pipeline nothing seemed to come out the end. There were times when the leaders in the electromagnetic process were joshed by their associates for attempting to produce vanishing quan-tities of U-235. The quantities literally were vanishing. Here again we were faced with the single chemical problem of separating U-235 from associated gunk. Due to the small quantity of U-235 and the extremely large quantities of gunk, consisting of a mixture of many other elements, normal chemical engineering did not apply. A precision of recovery was required that far exceeded normal production standards, but production engineers, assisted by research chemists and research engineers, finally devised and set up the necessary production line

As a means of illustrating the need for engineers in the atomic energy field I could go on enumerating examples of how the engineering approach was used for the solution of many of the complex problems confronting us. However, I prefer to draw on history only to the extent I have done in illustrating to you how the engineering approach for evaluating the task and organizing for the job was successfully applied. In this ap-plication we were assisted by the fact that literally we could draft any organization that we desired.

. the future of atomic energy depends primarily on how well engineers do their job.

Now let us take a look at the present and the future. Out of our experience in the Manhattan Project and in the planning for the development of atomic power it has become clear that the future of atomic energy depends primarily on how well engineers do their job. Let us look at some of the specific problems involved in

nuclear engineering. In a pile, whether it be for production of plutonium for bombs or for production of commercial power, the engineer is faced with new and difficult problems about which he has little experience, at least during the war he had practically

At the present time many engineers have the experience derived during and after the war project, but most engineers lack an educational training that permits them to solve these new problems without learning new principles required by the atomic era. Take, for example, shielding against radioactivity necessary wherever you have a chain reaction or radioactive materials. Here engineers were and are faced with strange requirements. One material might stop one type of radioactivity but not another. over, some materials merely convert one type of radioactivity to another. Health physics is involved and there is little industrial background for making the necessary statistical studies.

". . . gadgetry is what we are depending on as a delaying factor in other nations' efforts to make atomic weap-

One aspect of shielding is protection of the workmen. Another more important aspect is the remote control and maintenance problem. In the chemical processes, or in the working of the pile itself, the process equipment must be controlled and maintained by remote control methods. Intensive gadgeteering was and is necessary for doing this type of work. At Hanford complete chemical processes had to be capable not only of operation by remote control but also of maintenance by remote control. Some of the gadgetry involved is what we are now depending upon as a delaying factor in other nations' efforts to make atomic weapons.

Also involved in this chemical engineering is a need for precision of recovery not normally encountered in the light chemical industry. The value of plutonium or U-235 is so high that extremely high percentage of recovery is necessary in any ancillary chemical process in the production of power if such power is to be competitive with other sources of power. Not only is this precision chemical engineering complicated by the need for remote control apparatus, but also the transmutation from one element to another of the attendant products in a complicating factor.

The control of radioactive wastes. both liquid and gaseous, must be done to a degree not generally recognized

by other industries. Many millions have been spent at Hanford in the control of these liquids and gaseous wastes, and if commercial power is ever to be practicable, even greater effort must go into this problem in order to secure an economical solution. In my opinion the chemical engineermg involved in the production of power or in the production of plutonium is the major problem that must be more efficiently solved if we are ever to have competitive atomic

Other related problems that require solution or perfection in the solutions are in the field of heat exchange. Here we have problems that are beyond the experience of most of the experts in this field. In the heat exchange field we are faced with the difficulty of taking a tremendous amount of heat out of a very small volume. problem is further complicated by radioactivity. We must consider the nuclear properties of the coolants used for transmitting power from source to machine. We must consider not only the effects of the coolant on the nuclear reaction but also the effect of the nuclear reaction on the coolant. The temperatures involved are such that liquid metals may be the only suitable coolants. When we combine all these problems with the known characteristies of materials, we find ourselves working with some very nasty materials that introduce added problems of safe handling

Throughout the pile we are faced with engineering problems concerning materials and metallurgy. The materials used in the piles must meet functional and structural requirements and must stand up against the high temperatures involved. Not only must they stand up against temperatures for which we have insufficient practical experience, but they must also have the proper nuclear properties. Here again the materials may affect the nuclear reaction or the effects of the nuclear reaction on these materials may be such that the physical properties of the materials, such as the structural strength, conductivity, or molecular structure, are changed to such an extent that they no longer fulfill their basic missions. Here the research engineer must work with the physicists, for a tremendous amount of work must be done to determine the nuclear properties of ordinary structural materials and to develop new materials that can be produced in quantity that have the proper nuclear properties.

In the field of gadgeteering a tremendous amount of work must be done in remote control methods. Dependable methods and equipment

must be developed that are far beyond our normal industrial standards. It is costly to maintain equipment by remote control or abandon it when something goes wrong. If the economic problems of atomic power are to be solved, a greater degree of dependability must be built into just ordinary equipment than is required for any other industry.

Other engineering problems in volved pertain to industrial safety. Unfortunately, many of the scientific personnel involved in the development of nuclear energy do not have practical experience in industrial safety. The result is that unusually high standards have been set. Industrial safety engineers will eventually have to solve this problem and get it on a more practical scale if we are to have economical power plants utilizing atomic energy.

In solving all of these engineering problems the solution must be based on the needs of the operator or producer. A theoretical solution is of little value if it cannot be applied on an industrial scale. The engineer, by training and tradition, is accustomed to meeting the needs of the industrial operator in like problems pertaining to other fields. The engineer has bridged the gap between the scientists and the industrialists in other engineering fields such as electrical engineering, chemical engineering, metallurgical engineering, mechanical engineering, power and other, and there is no reason why he cannot render the same service in the field of nuclear engineering.

Other engineering problems pertain to the application of radio-activity or the use of radioactive isotopes to engineering research for developing chemical engineering processes or for developing better metallurgy. Radioactive materials can also be used in the petroleum industry. Other uses undoubtedly will be developed as ex-

perience is acquired.

The problem presently confronting our universities is to determine what courses should be introduced to adequately train engineers and scientists to handle the problems pertaining to the development of atomic energy. As a result of my experience in the Manhattan District, I would like to make certain suggestions concerning what might be done in the field of engineering education to better qualify our graduate engineers for handling problems in the field of nuclear engineering. I do not believe that a single course in our engineering schools will be the answer. In my opinion what is necessary is the introduction of nuclear engineering courses in the main fields of civil, mechanical, electrical and

chemical engineering. Such courses in their respective fields should stress the problems of heat exchange, metallurgy and materials, chemical engineering, gadgeteering or remote control, and industrial safety, all handled from the standpoint of how nuclear physics affects the solution of these problems when applied to nuclear engineering.

". . . the bulk of the problems pertaining to nuclear energy must be handled by engineers.'

Most universities have already tackled the problem of training gradnates for atomic energy development. Some progress has been made. Cornell, Princeton, Chicago, and practically every other large university have introduced courses in the field of nuclear engineering or engineering physics, but to my mind too many of them have stressed the research or scientific approach rather than the engancering approach. Just as we found during the war that once the basic concept of the atomic bomb was evolved that most of our major problems could best be solved by the usual engineering approach, to my mind the bulk of the problems pertaining to nuclear energy must be handled by engineers who have additional training in physics and chemistry rather than by physicists or chemists who have some engineering background.

I have analyzed one university's course leading to a master's degree in science, in which there is no question that they have stressed the physics. metallurgy and chemistry involved in nuclear energy. They have covered the scientific or research fields but they apparently have done little toward giving the student the engineer's concept of how to approach a typical engineering problem. I believe the universities are making a mistake if this is to be the main educational effort.

Greater progress can be made if we train engineers to handle nuclear problems just as we have trained chemical engineers to handle chemical problems involved in the engineering, design, construction and operation of production plants. Instead of giving a few courses in engineering to a student who is essentially a physicist, a chemist, or a metallurgist, greater emphasis should be placed upon giving students who have a basic engineering education, either civil, chemical, electrical, mechanical, or in any of the other engineering fields, the principles of physics and the problems of nuclear engineering involved in their particular field of engineering. For example, chemical engineers would major in nuclear chemical engineering, or a civil engineer major in nuclear civil engineering, each taking the necessary additional courses to qualify him for work in the field of atomic energy. The big thing we need today in the field of atomic energy is more engineers, more individuals with an engineering approach to the problem, and I see no reason why this field cannot be solved in the same way that we have made progress in other

fields of engineering.

Efforts to develop proper educational courses undoubtedly will be handicapped by the secrecy involved in the whole atomic energy field. Owing to the fact that the bulk of the work involved in the production of power is identical or similar to that involved in the production of weapons, this secrecy will be necessary for some time to come. The fact that practically all work is under government control is also a limiting factor. However there is adequate information available upon which an effective start in the field of education can be based. In addition, I would like to recommend that more university engineering departments should seek contracts with the Atomic Energy Commission or with its contractors for the development of the engineering research in this field. Also, more engineering professors should seek temporary employment with the contractors and the Atomic Energy Commission, in order that they can get first-hand information about the problems involved. They will then be in a better position to determine the basic educational courses in the field of physics and physical chemistry required and the revisions and additions necessary to our more standard engineering courses, all with the idea of giving better training to the engineer in order for him to carry his share of the load in the development of nuclear energy.

In conclusion, I would like to stress again that in my experience during the war and my observation of the activities of the Atomic Energy Commission since the war have convinced me-that our educational efforts in the field of nuclear engineering should be devoted primarily to giving supplementary education in the fields of physics and radioactivity to engineers rather than trying to give a little engineering to scientists. Although it is recognized that both approaches are necessary, I believe that the engineering approach to the problems of atomic energy will do far more towards expediting the solution of the remaining problems than the purely scientific approach. There is no mystery about atomic energy that teamwork and good engineer-

ing can not solve.

Editorial Viewpoints

SIDNEY D. KIRKPATRICK and Staff

AODS

In most companies, personnel is today's most important raw material. What is done to train it for present and future responsibilities is likely to have an increasing effect on progress and profits. So we were pleased to be reminded of still another mnemonie—this one in the field of industrial management. It came from none other than the honorary president of the General Electric Co., Gerard Swope.

The secret of management, said this sage of such wide experience, lies in these four words—Analyze, Organize, Deputize and Supervise. That is an improvement, we think, on with which we are more familiar, viz., "Organize and Delegate." Analyze is the first step toward organization. Supervision when interpreted to mean training as well as measuring performance is the logical way to get results in quality and quantity.

Just for fun, see how often you can apply AODS to your daily problems.

ABC Warfare

John J. Grebe, chief scientific advisor to the Army Chemical Corps, sees no earthly reason for any all-out war in the future. It could only come from "the desire on the part of a relatively short-lived, temporary regime to perpetuate its power by capturing and enslaving additional industrial capacity." Therefore the next war would be primarily anti-social, since the enemy would not want to destroy the facilities he desires to obtain. This emphasizes the importance of what Dr. Grebe calls ABC (Atomic, Biological, Chemical) warfare.

"The potentialities of ABC warfare, even in the hands of small nations, are such that powerful nations may fear and dread surprise attacks from them. In the hands of a great power, the potentialities are awe inspiring." Later, in his talk before the Chemical Engineers Club of Washington, he said, "Part of the reason why chemical warfare has been submerged for so long is the realization that the potentialities in this direction for fighting an efficient, anti-personnel war are so great that the military, as well as the civilians, naturally revolted against its use."

But is this a safe enough basis on which to hope for our future peace? We think not. Rather, we believe with Dr. Grebe that we can no longer neglect the branch of the Armed Services that could mean most for our strength and protection. Military research and sound chemical engineering development can become a most important instrument for peace as well as a powerful deterrent against war.

Would that more of our top technical men were willing to follow Dr. Grebe's example in devoting his great energy and ability to the organization "that has been able to do so much with so little."

Canadian Reciprocity

Our brief visit to Toronto to witness the opening of the second Canadian International Trade Fair last month convinced us that our good northern neighbors have a tremendous interest in foreign trade. And they are going to do their best to balance it, even if it means the sort of austerity that comes from buying less from us and more from their customers overseas.

Some of our industries that will find increasing competition from Europe, we were told, include capital goods and heavy equipment. The president of Britain's Board of Trade said he was returning to England with the conviction that British engineers and industries should take a more active hand in the development and exploitation of Canada's rich resources for hydroelectric power, metals and minerals. Our own Secretary of Commerce, Mr. Sawyer, counseled for a better balancing of U. S. trade through increasing our imports of Canadian raw materials. Two of most significance in the future are oil from the western provinces and iron ore from Labrador. We are the logical market for these-just as Canada is the logical market for our capital goods and engineering services.

Strategies Need Attention

Uncle Sam is now entering the markets more aggressively in his building of stockpiles. Purchases of strategic materials are being made in a manner that was not possible until recently without depriving industry of currently needed raw materials. This brings a new responsibility to many of us.

The opportunity and the problem are well illustrated in the case of rubber and certain strategic vegetable oils. These commodities cannot be bought and put in a pile to be kept more or less indefinitely in readiness for some military emergency. They can be stored for only limited periods without serious depreciation.

This fact is creating new opportunity and new responsibility for the industrial users of these commodities. Industrial users must be ready to take back from the government some of the aging stocks and process them into commercial products of good quality before they spoil beyond the point of practical usefulness. Fortunately, Congress recognizes this need in the stockpile laws.

Many chemical establishments have an indirect, if not direct, opportunity in this development. They may become a part of the stockpile program by trading new raw material to Uncle Sam for a larger quantity of aged raw material from the stockpile. This is not a responsibility that has hitherto been presented. But now it is one that will require careful appraisal in order that the public interest can be served without financial sacrifice in the processing industry.

Most important is the development of some program whereby regular users of these strategies take the responsibility of trading and processing in order to maintain the government stocks of suitable age. If they do not, they will find themselves in competition with newcomers in processing, some of whom may be of the shyster variety. And, worse than that, they may find that in some emergency they will be compelled to use subgrade materials at a time when that will impose a serious handicap.

The interest of government and industry is common if the job is wisely planned on a correct technical basis. And this basis should provide, among other things, for the most modern and effective methods of storage in order that the aging of strategic stocks may be kept at a minimum. Even the best methods will be none too good for indefinite stockpile maintenance.

Disasters' Aftermath

Los Angeles will soon have a complete set of ordinances to govern the production, transportation, use and storage of "dangerous" chemicals. (They are defined as those set off by light, heat or shock.) The spark that set off this action was the blast caused by the unsafe use in 1947 of large quantities of perchloric acid by an incompetent chemist who did not live to defend himself.

Inspired by the more recent explosion and costly fire in Holland Tunnel of a truck badly overloaded with carbon bisulphide, the state legislature in New Jersey is currently considering a measure that would prohibit the transportation of explosives, poisonous gases, and dangerous chemicals over interstate crossings and would greatly increase the penalties for violations. This bill cannot be effective without current action by New York and Pennsylvania, but ultimate passage is almost certain.

Measures such as these are conceived in the interest of public safety. When properly drawn and enforced, they offer some insurance against the recurrence of these great misfortunes that too often plague the process industries. But even though we legislate against carelessness and incompetence, the only sure preventative is eternal vigilance in enforcing what we know are safe practices and procedures.

A Wise Precaution

Synthetic glycerine is manufactured to meet USP specifications and theoretically could be used wherever that product is called for. In its manufacture, however, synthetic glycerine picks up very small quantities of certain organic chlorine compounds not present in the natural material. Accordingly, its manufacturers have definitely recommended against use of synthetic glycerine in foods or drugs intended for internal uses.

This conservative marketing policy is based on the fact that some of the organic chlorine derivatives might conceivably exhibit toxicity. Since some of the possible impurities might be chlorohydrins, compounds of significant toxicity, this seems to be a very wise precaution. It is one which has been imposed voluntarily but one which has occasioned immediate compliment by the interested federal authorities. It would be commendable if more companies were as careful as Shell Chemical when they introduce new synthetics subject to possible misuse.

Sound Rubber Plan Expected

Reconstruction Finance Corp. recently presented a most constructive report to the President and the Congress "with respect to the development of a program for disposal of the government-owned rubber-producing facilities." This document gives added prestige to those who have handled the rubber program for Uncle Sam during recent years.

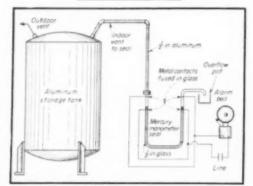
It is significant that a government group should proceed from the assumption that the government is going to get out of business. It is still more pleasing to find that the government agency involved expects to do this in an orderly way and to leave actual funds in the Treasury greater than the original wartime expenditures for an immense emergency job on which three-quarters of a billion dollars was expended. It is amazing that not only will that large sum be returned to the Treasury, but also that the Treasury has been paid interest on the funds during their use, at a rate equal to the cost of outside money.

We do not expect that Congress is going to rush into legislation this year in order that an immediate disposal programs can be undertaken. But RFC is taking step by step such further actions as will make the ultimate disposal constructive, profitable to tax-payers, and sound from the point of chemical, petroleum, and rubber-products industries. It is most gratifying that all of these benefits are possible and that next year Congress may be able to take the necessary legislative action without too much difficulty.

The Plant Notebook

THEODORE R. OLIVE, Associate Editor

We regret that the prize winning article originally intended for this space has been unavoidably withdrawn.—Editor.



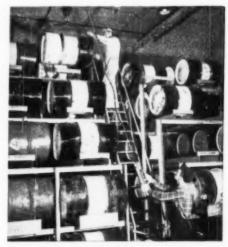
Alarm and Sealed Vent for Fuming Liquid Tanks

A. Y. Tabani, Nekoosa-Edwards Paper Co., Port Edwards, Wis.

It frequently happens that a fuming liquid such as glacial acetic acid is stored in an aluminum tank which will stand only 3 to 5 psig, pressure or vacuum. Such tanks are vented out-of-doors but in the winter there is danger of plugging the vent owing to freezing of the vapors or condensation in the line. When this happens the tank may explode from increase in pressure, or collapse due to the vacuum resulting from pumping out the contents. Relief valves are likely to give trouble from corrosion so I devised an alarm and liquid sealed vent system as described here to overcome the possibilities of trouble.

In addition to the regular outdoor vent an inside vent of aluminum tubing is provided, connected to a mercury filled glass U-tube provided with two sets of metal contacts sealed in the glass at appropriate points. The metal contacts are connected in parallel as shown in the drawing and in turn are connected into an alarm bell circuit so

that either a predetermined pressure or vacuum increase will cause the mercury to rise high enough in one leg or the other of the U and complete the contact. On the pressure side the U is provided with a discharge pot so that a pressure large enough to sound the alarm will blow the mercury from the system and relieve the pressure. When vacuum is created sufficient to sound the alarm, the pump can be shut down immediately, either manually, or by a simple relay arrangement.



Safety in Drum Handling

At its Mansfield, Ohio, plant Westinghouse Electric Corp.'s electric appliance division has worked out a safe system for storing drums of paint thinner as shown in the view above. The method should be equally handy for other drummed products. The handling means is a floor operated bridge crane, combined with a movable ladder. Use of spark-proof floors and tools, explosion-proof electrical fixtures and fittings, and a good exhaust ventilating system are other safety features of the installation.

• JUNE PRIZE WINNER-A \$50 prize will be issued to . . .

MAX F. MUELLER

Chemical Engineer, Baltimore, Md.

, . . for an article describing a method of testing very low pressure tanks for leaks which has been shown accurate and reliable in over three years of use by the author. The article has been judged the winner of our June contest and will appear in the August issue.

\$50 PRIZE FOR A GOOD IDEA-Until further notice the Editors of Chemical

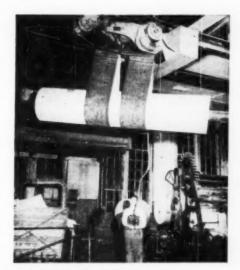
Engineering will award \$50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the July winner will be announced in August and his article published in September. Judges will be the Editors of Chemical Engineering. Non-winning articles submitted for this contest will be published if acceptable at usual space rates.

HOW TO ENTER CONTEST-Any reader of Chemical Engineering, other

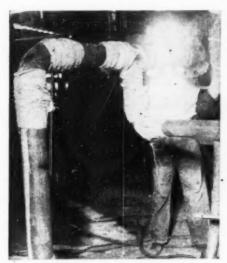
than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated it possible. Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries.

Also, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address Plant Notebook Editor, Chemical Engineering, 330 West 42nd St., New York 18, N. Y.



One Way to Move Rolls

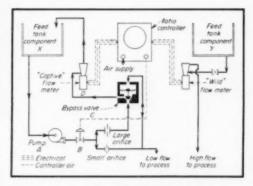
A sling made of two sections of wide belting suspended from a Yale hoist of the 5-ton, variable-speed, motor-driven trolley type is used by one manufacturer of heavy roll material for handling safety. The sling is quickly wrapped around the roll, either in storage or on the processing machine.



Improved Technique Developed for Welding 4-6 Chrome Pipe

In fabricating 4-6 percent chrome pipe for installation in a large Texas oil refinery, Houston Pipe & Steel, Inc., developed a new technique which yields excellent properties in the weld metal. The process consists in preheating the joint to 600-800 deg. F. with an oxyacctylene preheating torch having a large tip. The joint is then welded using

a G-E chrome electrode Type W-1502 (ASTM-AWS Spec. No. E-502). As soon as the joint is completed it is then heated with the torch to 1,200-1,350 deg. and immediately wrapped with asbestos tape to a minimum thickness of 1 in. It then cools slowly to room temperature. Test coupons showed an ultimate tensile of 73,200 psi., with a Brinell of 248 in the weld metal and 174 in the pipe. Analysis of the weld showed 7.73 percent Cr, with 4.53 percent in the pipe. If still better ductility is needed the pipe can be given a furnace anneal to 1,600 deg. after its initial cooling, resulting in an average elongation of 40 percent in 2 in.



Micro Metering Arrangement for Viscous Liquid Flow

JOHN F. SCHNACKY, Fischer & Porter Co., Buffalo, N. Y.

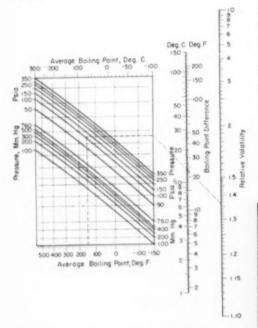
In the past there has often been difficulty in tieing very low flow rates of viscous materials into automatic control systems. The reason usually is that such flows must often be measured in the transitional range of Reynolds numbers, where the flow is neither viscous nor turbulent and flow coefficients cannot be predicted with accuracy. Also the coefficients may change rapidly with a small change in the Reynolds number. Many processes have therefore been forced to depend on end-product analysis further along the reaction line, often meaning a serious lag in the control system. Other methods attempted have offered the difficulty of stringent calibration on the equipment, suitable for only one given set of conditions. The accuracy required has placed a high premium on the equipment needed to accomplish the desired result.

The system illustrated here makes the result attainable in a simple, precise, reliable and economical way, requiring only a few simple auxiliaries. The object of the system is to meter a flow which is large enough to make the meter viscosity immune, but to take off from the main flow of viscous liquid a fixed proportion of the total which is the desired small flow of viscous material. The remainder returns to the supply tank. As shown in the sketch the small flow of component X can be supplied in fixed proportion to a high-flow material, component Y.

In the sketch the control valve B is placed immediately after the pump A. Following the control valve the viscous flow is split, each line passing to an orifice. The orifice areas are ratioed so that the required small flow range of component X is obtained through the small orifice, while the flow through the larger orifice is great enough to give viscosity immunity in the subsequent flow meter.

A pressure tap taken off the downstream side of the

small orifice operates the bypass valve C, which automatically throttles the bypass line so that the downstream pressures of both orifices will be equal. Then the bypass valve discharges through the flow meter D which measures an exact multiple of the small flow to the process. The material in the bypass line then returns to the supply tank. In this way flow meter D can measure and control an exceptionally small flow in the transitional region, by virtue of measuring an exact multiple of the flow desired. Although not necessary for the use of this system, connection can be made into a ratio control system as shown if desired.



Alignment Chart for Calculating Relative Volatility

WILLIAM C. FRISHE, Chemical Engineering Department, Clarkson College of Technology, Potsdam, N. Y.

The great progress that has been made in recent years by the petroleum industry in the fractional distillation of hydrocarbons with sharp separation has created a demand for rapid design calculation methods. The difficulty of separation is indicated by the relative volatility of the components of the feed stream. Where complete vapor pressure data are at hand the relative volatility is calculated as the ratio of the vapor pressures of two components. Frequently, however, complete and reliable vapor pressure data are not available and so a general need exists for a simple method of determining relative volatility from physical constants. A method has been developed by Melpolder and Headington [Ind. Eng. Chem., 39, 763 (1947)] for calculating the relative volatility of binary mixtures from boiling point difference, absolute boiling point of the mixture, and total pressure. In the form of an equation it is:

$$\operatorname{Log} \alpha = \frac{\Delta T}{T} \left(7.39 - 1.15 \log P + \frac{T}{179 \log P} \right)$$

where P is the absolute pressure in millimeters of mercury at which T and ΔT are measured. T is the average boiling point of the mixture in degrees Kelvin. ΔT is the difference in boiling points of the two components in Centigrade degrees. The scales of the accompanying alignment chart have been extended to include temperatures in Fahrenheit degrees and pressure in pounds per square inch absolute.

In the example shown on the chart it is desired to calculate the relative volatility of the two key components of a mixture having a composition of: propame, 0.50, isobutane, 24.5, n-butane, 73.5, and isopentane, 1.5 mol percent. Cooling water and heating steam conditions require that a pressure of 100 psig. be used. Assuming the mixture to be a binary mixture of n-butane and isobutane, we have the physical properties at 100 psig.: isobutane boiling point, 132, n-butane boiling point, 155, and average boiling point, 146 deg. F.

On the chart enter at 146 deg. F., average boiling point, and continue to the intersection with a pressure line of 114.7 psia. From there proceed horizontally to the pressure axis. Connect this point with the boiling point difference (23 deg. F.) and continue to the relative volatility scale at 1.36.

As a check on this calculate the relative volatility from vapor pressures. Isobutane vapor pressure at average boiling point=134; and n-butane vapor pressure at average boiling point=99. The ratio of vapor pressure is 134/99 or 1.355.

The method is applicable only to mixtures such as the paraffin hydrocarbons in which there is no appreciable deviation from Raoult's law. Values of relative volatility above 10 are unreliable when calculated by the formula.



Hot Air De-Fogs Pickling Vats

A method used for de-fogging the air in the acid dipping room of Jones & Laughlin's pipe pickling and galvanizing shop at the Aliquippa, Pa., works seems to have possibilities for de-fogging other areas subjected to acid fumes. The method consists in using four large Dravo air heaters to create a warm air blanket over the vats. Formerly the condensation of vapors rising from the ten 3,000-gal, acid tanks obscured visibility so badly during cold weather that it was sometimes necessary to shut down operations. With the warm air blanket created by the four 2,000,000-Btu, per hr. heaters, the fog has been materially reduced and is no longer froublesome.



THE WATER PROBLEM

What is happening to our water? Are declining ground water tables and heavily polluted streams in industrial areas the harbingers of future trouble for the chemical industries? What methods are engineers using to conserve water? Here are the answers in this report on the universal raw material-water.

CHEMICAL ENGINEERING REPORT-JULY 1949

Water keeps the chemical process industries alive. Without it, these industries would writhe convulsively like some prehistoric monster and, tongue out, expire. For too long makers of chemicals have been taking an adequate supply of water for granted. Today, they can no longer afford to do so.

Getting

Getting enough water of the right temperenough ature and quality, either from underground or is a job surface sources, has become one of the toughest jobs for a chemical enterprise. Elaborate engineering techniques are required today to develop and to conserve adequate supplies of water. As a result, water costs are inching up.

Making chemicals consumes tremendous vol-

umes of water. It is the universal raw material. In most chemical industries, the quantity of water required is the greatest single item that goes into the plant. In some instances as much as 300 lb. of water is required for each pound of finished product.

Look at a few specific examples. It takes 5,- How much 000,000 gal. of water to make a ton of bromine, do we To get a ton of magnesium from sea water, 300, need? 000 gal, of water must be used.

Each pound of butadiene made calls for 160 gal. And it takes 600,000 gal. to make a ton of GR-S.

Making a ton of viscose rayon requires 200,000 gal. Byproduct coking takes 3,600 gal. per ton of coal. Soap factories use 500 gal, for every ton of soap turned out. Each ton of smokeless powder requires 50,000 gal.

For every 1,000 bu, of grain mashed, distillers

use 600,000 gal. of water. Distillers using molasses require 8,400 gal, of process water and 120,000 gal. of cooling water for each 1,000 gal. of 100-proof they make.

Sulphate pulping takes 70,000 gal. per ton of product. Soda pulp bleaching requires 60,000 gal. per ton. A paper mill at Houston uses 22,000,000

gal, of water a day.

Oil refiners use 770 gal. per 42-gal. barrel. Construction of a chemical plant in the Panhandle, to use natural gas as a raw material, was not authorized until a deposit of the other raw material-8,000,000 gal. of water a day-was discovered. It will take as much as 50,000,000 gal, of water a day to make 30,000 bbl, of oil from coal.

What do the chemical process industries do Whee with all this water? Biggest single use by far is water is for cooling. Other uses include water for processused for ing, boiler feed, air conditioning, drinking and sanitary purposes, and fire protection.

Consider water for each of these services as a raw material. As such, it must be conditioned and treated to meet specific needs. The variety of chemical industries consuming water is so great, and the specific physical, chemical and bacterial requirements so diverse, that it is impossible to come up with standard specifications for water quality. One chemical industry's water is another's poison. What is more, water quality requirements in the same chemical plant change as processes are refined and new ones developed.

Of greatest economic importance in determining the value of water to the chemical industries are temperature, total solids, hardness, organic and inorganic contaminants and chlorides. The relative importance of each of these depends upon the service for which the water is required. What is the concentration of these constituents in the water? What is its temperature? The answers to these questions determine the dollar value of the water supply.

Generally, ground water is colder than surface water: it contains less suspended matter and is more apt to be free from contamination by sanitary and industrial wastes. However, ground water often contains higher concentrations of

soluble salts.

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as well as

quantity

Characteristics of surface waters vary widely. Lakes, especially the Great Lakes, are not influenced seriously by drought conditions. But rivers, particularly tidal streams, fluctuate considerably during wet and dry seasons. The Delaware, Scioto and James Rivers, for example, have shown variations in hardness and salinity during high and low stages. When the runoff is reduced, river water gets harder. Moreover, salt water penetrates upstream during droughts, increasing the salinity. Serious operating difficulties have occurred in plants where engineers failed to take into account such changes in the chemical characteristics of flowing streams.

Sea water is fairly satisfactory for many industrial purposes, particularly for cooling. available in volume, it exhibits limited fluctuations in temperature and chemical quality compared with fresh water surface sources.

Cooling water requirements of the chemical industries are enormous. Here, the volume available and the temperature are of the utmost im-

portance, far outweighing considerations of quality. The value of an abundant supply of low temperature cooling water can be evaluated on a dollar basis. It can also be interpreted as equivalent refrigeration tonnage. The quality of the water supply cannot be completely ignored, however. For dissolved salts, gases or byproducts can corrode heat exchangers.

There is probably no single water supply factor of greater economic importance than the temperature of the water available. It governs design of equipment and the heat balance of many chemical processes. Often the cooling water temperature range of a process is critical. The temperature requirement can overrule all others. Plant sites have been chosen not only because of the availability and volume of a water supply but because of its low temperature.

In most places, the temperature of the surface water tends to follow the atmospheric temperature throughout the year. Water from deep wells, therefore, is better than surface water for heat exchangers because of its lower and more

uniform temperature.

Rapid growth of chemical industries in the Louisville, Ky., area, in the Panhandle of Texas and in the east Houston area, as well as else where throughout the country, is directly related to the availability of cold water from underground sources. In the wake of this expansion has come rapid exhaustion of wells due to industrial over-concentration and heavy pumping. Industries in Texas, at Louisville and in the Los Angeles area, consequently, have to tackle some tough water supply problems. Depletion of ground water has made it necessary to use more and more surface water and to install cooling towers and other facilities.

Impunities in cooling water that cause the Impure most trouble are: scale-forming constituents; water suspended matter; dissolved corrosive gases; acids; means oil or other organic matter; and slime-forming trouble organisms. Well water cantains less suspended matter, dissolved oxygen and fewer microorganisms than surface water. But some deep well water is very hard and contains iron, manganese. fixed sulphides and sometimes ammonia, which corrodes certain metals and alloys. Surface water, used either once-through or recirculated, can also cause trouble due to these same impurities. Suspended solids lodge on heat exchanger surfaces, and, when accompanied by bacterial slimes and corrosive products, impair cooling efficiency and speedily attack metals. High temperatures in heat exchangers accelerate the action of these impurities.

Specifications for process water in the chem Purity ical industries are bewildering in their diversity, means Water going directly into the process must be different treated to meet the special requirements of the product being manufactured.

For example, aluminum and certain other people metals are objectionable for the manufacture of photographic films. Fermentation processes improve as the sulphate concentration of the water increases.

Most important requirements in the paper and textile industries are freedom from color, turbidity and suspended matter. There are also limitations on the content of hardness, manganese

Most important Inctor: How cold

things to different

and iron. Slime formations, algae and microorganisms must be controlled in paper mills, especially where the raw water is heavily polluted.

Process water for the manufacture of pharmaceuticals and biologicals requires more purification than the water used in any other chemical industry. No matter what its source, the water must be treated. Even clarification and softening do not always suffice. For example, the water used in making serum must be pyrogen-free.

Boiler feedwater must meet the most exacting of water quality requirements. This is especially true in plants where makeup is a high percentage of the total feedwater. High-pressure steam boilers demand water from which almost all organic and inorganic solids have been eliminated. Even

traces of silica can cause trouble.

Water supply . . .

. Enough

everywhere

but not

Once we comprehend the Niagara of water it takes to manufacture chemicals and realize how critical are the temperature and quality requirements, the next question asks itself. Is there enough water? The U.S. has abundant supplies of ground and surface water. However, all areas do not share equally in this abundance. Moreover, two man-made problems-ground water depletion and stream pollution-further aggravate the situation in congested industrial areas. Before we turn to the areas of critical importance to the chemical process industries, let us take a look at the over-all U. S. water supply situation. The U. S. has plenty of water. The enormous

quantities used are far less than the amount that falls from the sky. Average annual precipitation is enough to cover our entire 3 million square miles to a depth of nearly 30 in. It amounts to almost 5 billion acre-feet or 15 million billion gallons. Great as are the quantities used, they are still exceeded by the amount of water in

streams and underground reservoirs.

The line of 20-in, average annual rainfall corresponds approximately to the 100th meridian. East of the 100th meridian, surface water is normally in excess of the requirements of the population. West of this line dividing water abundance from water deficiency, there is a falling off of precipitation and therefore of available water. This increases southward to create the region of greatest deficiency comprising Arizona, New Mexico. parts of Texas, Colorado and California. An interior region of deficient rainfall known as the Great Basin includes Utah and Nevada. Rainfall again becomes abundant along the Pacific Coast, increasing northward to average annual amounts well over 100 in. in the Olympic Range of Washington.

America spends more than \$1 million every day for ground water. Use of ground water rose from 10 billion gallons a day in 1935 to 20 billion gallons a day in 1945 and is still increasing. Here is a breakdown of its daily use in 1945:

													H	ı	11	ion	Gallons
Irrigation																	0
Industria!																	5
Municipal																	3
Rural					÷	*	÷		4								2

In addition to the 5 billion gallons a day it got from its own wells in 1945, industry also used some of the 3 billion gallons a day that came from municipal water supplies.

But ground water accounts for only 20 percent of all water used. The other 80 percent is surface water. This means that in 1945 a total of about 100 billion gallons of water a day were used. With 140 million population in 1945, this was a per capita consumption of about 700 gal. a day for all purposes, excluding generation of hydroelectric power and recreational use.

Today, we may be using as much as 25 billion U.S. uses gallons a day of ground water. Add to that 100 125 billion gallons a day of surface water. You come billion up with a total of 125 billion gallons a day, being used for all purposes by 148 million people. This is a per capita consumption of over 800 gal.

Undeveloped and perennial ground water supplies conservatively estimated at a total of from 50 billion to 500 billion gallons a day are available to American municipalities and industries. But they have to be found and properly developed. Shortages of ground water are usually due to inadequate hydrologic engineering.

Purified water is delivered retail to most U. S. customers at 5c. a ton or less-cheaper than dirt. But ordinary water can be very expensive to a chemical plant because so much is needed.

Next, we examine a few of the chemical manu Critical facturing centers that have had serious water oreas: problems. In Texas the water demands have Texas climbed 7,000 percent between 1890 and 1940, although the population increased only 28' percent. Water consumption since the war is at an even greater rate. Along the Gulf Coast, where some 25 active chemical companies have \$1 billion invested in petrochemical plants, annual ground water usage is estimated at about 300,000 acre-feet and surface water consumption at 3 to 5 million acre-feet. Probably half of this total is for industrial use. At present, Texas is using its ground water faster than nature can replenish it. Ground water resources in the Southwest support 75 percent of the total water consumers. But the turning point in this wasteful distribution of natural water resources is at hand. Already, progressive chemical companies along the Gulf Coast are protecting ground water by water procurement from abundant surface supplies.

What happened at Texas City is typical. Until recently practically all Texas City industries got their water from wells. Now Pan American Refining and Carbide & Carbon have supplemented their ground water supplies with surface water

diverted from the Brazos River.

In 1930 the industrial plants in the area were Water Southport Petroleum, Stone Oil and Texas City toble Terminal Railway. Pan American Refining be. dropping gan operating in 1934, followed by Republic Oil in 1937, Carbide & Carbon in 1941, Tin Processing in 1942 and Monsanto in 1943.

Pumpage in the Texas City area soared from about 1.5 mgd. in 1930 to about 23.3 mgd. in 1945. Static level in one 1,000-ft. deep well dropped to 102 ft. below sea level in 1945; in another 610-ft. well, to 165 ft. below the surface in 1944. The earth, deprived of its support, was sinking at the rate of 2.4 in. a year. In some places, there had been a ground subsidence over limited areas of from 12 to 18 in. Something had to be done.

So Pan American and Carbide & Carbon had a canal built that can bring 275 mgd. of Brazos

CHEMICAL ENGINEERING-July 1949

River water to Texas City. At its peak capacity of 2,740 million gallons, their new storage reservoir holds enough water to last them 110 days at a usage of 25 mgd., with each taking half of the water. Today, Carbide & Carbon pumps only 300 gpm. from wells for sanitary water.

Celanese depends on the Nucces River for over 90 percent of the water used within its plant, taking less than 390,000 gpm, from only three of its 10 wells at Bishop for sanitary water and boiler feed makeup. Even so, the Nucces River, with its single small dam, is capable of providing almost 20 times as much water as is being used from its flow at present. In all of South Texas less than 2 million acre-feet of surface water are being used each year, but average annual runoff available for use is three times this amount.

Surface water will be the open sesame to the industrial future of Texas. In the entire Gulf Coast area, current surface water demand is surface not more than 15 percent of the surface water water resources. All Gulf Coast users of surface water today probably require less than 5 million acrefeet of water a year. Yet runoff flow of all rivers is 43 million acre-feet a year, or about eight times the present use.

Today, Texas has some 34 major surface storage facilities with a total capacity of 12,256,840 acre-feet. Fifteen are for municipal and industrial use. Twelve more are authorized.

In southern California, many refineries and chemical plants, among them those of California Standard, Shell Chemical, Dow, General Chemical and Stauffer, depend upon underground sources for much of their water. Yet the coastal plain of southern California is one of the most heavily developed ground water areas in the U.S. Where the ground water has been pumped out, the land has even sunk, in one place as much as 8 ft. Well failures are not uncommon. As a result of too much pumping, salt water from the ocean is encreaching at many places from Santa Monica to Santa Ana. Moving through gaps in the subterranean barrier, this ocean water threatens to invade the deeper water-bearing zones of southern California's coastal plain.

The West Basin, southwest of Los Angeles, seriously overdeveloped. There the total is seriously overdeveloped. ground water withdrawal in 1945 was 90,000 acre-feet, twice the fresh water recharge. Near Long Beach, the water table is now as far as 75 ft. below sea level, due to excessive pumping. As a result, salt water from the sea is now moving inland at rates up to 300 ft. a year. As much as 25,000 acre-feet a year may now be moving into the aquifers. Encroachine salt water has captured a 2-mi. deep beachhead between Redondo Beach and El Segundo.

Increasing chloride content of water from their own wells worries producers of chemicals in southern California. And all the city water they use in their plants must be treated. Los Angeles city water, stored in open reservoirs and unfiltered, contains algae and, since part of it comes from the Colorado River, it is high in total dissolved solids.

A decade of drought and mounting pump-Critical areas: age of ground water in the Indianapolis area Indiana came to a critical climax in 1941, when 52 mgd, were pumped and the ground water level reached its lowest. In downtown Indianapolis, where air conditioning laps up water, the water level was lower than 50 ft. in that year. Surrounding industrial areas were also hard hit.

Rainfall in 1942 brought some relief, but thereafter war industries in Indianapolis in-creased their pumpage. Since 1945 ground water levels have been coming back, due to more rainfall and less pumping. Today, many companies have, like Eli Lilly, installed cooling towers to conserve water. For another drought could cause an even more serious decline in water levels.

With as much as 300 mgd. being withdrawn Critical in some years, overpumping from wells in western Long Island, mainly in Brooklyn, became serious as far back as 1933. Over an area of more than 40 sq. mi. the water table was below sea level; encroaching salt water had ruined many wells. A state law was passed requiring that water for cooling from wells pumping more than 100,000 gpd. be returned to the ground through artificial recharge wells. More than 60 mgd. is now returned by over 300 wells. Taking more water from upstate reservoirs, Long Island in 1947 shut down a 27-mgd. public supply well field. Water levels are slowly recovering from the all-time low in 1941. But they are still far below sea level in many places. and sea water still creeps inland where pumping is heavy.

Take Louisville, Kv., as another example. Critical During the war, the synthetic rubber plants of Goodrich, Carbide & Carbon, National Carbide and Du Pont mushroomed there. Alcohol distillers like Seagram and National Distillers were running all out. At the wartime peak in 1943 these industries were pumping 75 mgd. Before the war only 37 mgd. had been pumped. Water levels dropped so fast that some wells were down to a quarter of their normal yield. Near the synthetic rubber plants, there appeared to be less than a 2-yr, supply underground.

All these developments had been made without a prior investigation of the ground water reservoir, its permeability and natural recharge When the U. S. Geological Survey was called in, it quickly mapped the reservoir and determined water sources and amounts of recharge. It was found that the existing recharge was only 40 mgd. The industries had to act fast.

They did. Use of water was cut by means of cooling towers, recirculation and other watersaving measures. Some industries began to buy city water, which Louisville gets initially from the Ohio River. Others relocated their wells closer to the river to draw in added recharge. A few artificially recharged the underground reservoir with city water or ground water that had been used for cooling. By 1945 the pumpage had been decreased to about 45 mgd. and now it is less than 40 mgd. The problem was solved, but at a cost of about \$5 million.

Irony of the situation is this: the USGS in- could vestigation proved that several hundred million have gallons a day of cool ground water can be ob- soved tained by locating wells along the Ohio River \$5 to the north and south of the city, where the million water can be made to infiltrate from the river

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Critical

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lets in sea water

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switch to

at tremendous rates. Had this been known beforehand, most of the \$5 million could have been saved.

Solution Use USGS date

Even from these few examples some of the engineering methods that can be used to conserve water become apparent. Basic information on the supply of water available is indispensable. Stream flow data covering long periods are required to appraise a surface supply; evaluation of the yield of an underground source calls for a painstaking hydrologic investigation. Fortunately, the chemical industries have on tap the enormous data amassed by the USGS on stream flow, ground water levels, water quality and water temperature. Failure to evaluate the reliability of a water supply in advance inevitably means disappointment and financial losses.

With more accurate hydrologic information on well fields, it has been possible to relocate wells to obtain the most efficient spacing. Larger diameter wells, some gravel-walled, have been developed; their durable screens have large enough openings to permit increased yields. Deep well turbine pumps, electrically driven and automatically controlled, often discharge directly into mains at points advantageous to secure the proper pressure. High capacity wells with multiple well points connected to a central pumping system can tap ground water or induce infiltration from rivers. Typical of these horizontal collectors are the Layne-Bowler and

Ranney wells.

Solutions: Use

Water economy within the plant calls for climination of wasteful practices, for installawisely tion of multiple water systems, for recirculation what you and re-use of water, and for reclamation of usable water from plant effluents.

A first step is to overcome the fetish of plant operators for wide-open valves. They must be taught to use less water. Often warmer water is satisfactory; one plant successfully switched from 40 to 60 deg. F. water in a process. Multiple water, treatment and sewage systems per-

mit savings.

Progressive treatment of raw water is possible. Water of different grades and temperatures can be used for different purposes. One big industrial plant in Ohio circulates cooling water progressively through heat exchangers requiring 54 deg. F. water and finally through units in which 85 deg. F. water is satisfactory. Process water may be utilized at increasing concentration levels. Separation of cooling water from waste water makes stream pollution control casier.

Solutions:

Once-through use of water is wasteful, Cir-Recycle culating water over cooling towers brings enorcooling mous reductions in the volume of water required. water With 160,000-gpm. cooling towers, only 6 to 8 percent makeup is required at the Texas City plant of Carbide & Carbon. Celanese, at its Bishop, Tex., plant, actually recirculates cooling water as many as 50 times before discharging it because of low quality.

By recirculating process water, Celanese cuts its requirements from 230 mgd. to 4 mgd. There are four major process water cooling towers at the Chemcel plant, capable of circulating a

total of 150,000 gpm.

Southland Paper Mills at Lufkin, Tex., recir-

culates 3 mgd. of mechanical cooling and pump sealing water. It sends bearing cooling water from the power house over the cooling tower for the turbine condensers, gets back 96 percent of it, for a total of 720,000 gpd. Another system at the dry end of the newsprint plant picks up the water used to cool bearings, an air compressor, the sweat dryers, the reel drums and the friction brakes on the unwinders. This, together with scaling water from the vacuum pumps, nets Southland another 2,280,000 gpd. Cost, in dollars of capital investment per gallon per minute, is only two-thirds that of a new water source. And with well water at 85 deg. F., cooling water demand is enormous.

In an Ohio steel mill, cooling water is recirculated: drainage from drinking fountains and filter wash water are returned to the raw material reservoir for re-use; and even boiler blowdown and ash spray waste water are retained in

the mill water circuit.

A large West Coast steel plant recirculates cooling water and re-uses effluent water from its sanitary and industrial waste treatment works. The only water leaving the closed drinking and mill water circuits is that lost through windage and blowdown. Hardness of water in the mill circuit is controlled by shunting part of the supply through a cold process softener.

Diversion of cooling water to process use is proving profitable in a ceramics plant.

Re-use is a big water saver in the process Solutions: industries. In starch manufacture the steep Reclaim water is now recycled completely. Where water process is used for extraction, it is advantageous to recycle it. Paper mills now recycle all of their white water. A board mill with efficient purification and recirculation of water can get by with 1,000 gal, of fresh water per ton of product, while a pulp mill making bleached pulp and re-using little of the mill water requires as much as 50,000 gal. per ton.

Reclaiming white water by clarification. Southland Paper Mills at Lufkin, Tex., gets back 1.5 mgd. of water for its kraft mill. First Spaulding clarifier of the upflow sludge type ever put into successful full-scale operation in the pulp and paper industry saves this water for Southland. It was installed by Permutit.

A Texas refinery treats its waste waters to avert stream pollution and thereby greatly conserves its limited fresh water supply

Recirculating and re-using water has an added advantage: supply lines for fresh water and sewer lines can often be smaller and less costly

to install and maintain.

Water is also reclaimed from sewage plant ef- Solutions: fluent for industrial use. Bethlehem Steel, with Con use an option to take 100 mgd., now buys 40 mgd. of sewage sewage effluent from the city of Baltimore. At its Sparrows Point, Md., treatment plant, largest in the world, Bethlehem processes this effluent by alum coagulation, settling and chlorination to get usable industrial water. Cost, exclusive of fixed charges, is 1.73c, per 1,000 gal. As a result. Bethlehem has cut back its pumpage of ground water from 15,000 gpm. to 3,500. From a dangerous low of 150 ft. in 1940, the ground water level is back to a comfortable 80 ft. Effect of water from sewage on a process must

be carefully evaluated, however. Sewage water is high in ammonia, which corrodes brass condenser tubes.

Solutions: and

Methods of treating water are being improved Ion all the time. Companies like Resinous Products, exchange Dow, Dorr, Infilco, American Cyanamid and Permutit are constantly experimenting with ion exchange resins. Capacities of these resins, now between 12,000 and 30,000 grains per cu. ft., are being increased. Particle size is being cut down to get greater surface effects. While so far it has been impractical to treat concentrations as high as 1,000 ppm., the new resinous zeolites have possibilities for demineralizing sea water. Use of zeolites to bring down salt concentration could be followed by evaporation. Supersonics, too, has possibilities for water treatment that are being investigated by the Navy and at Rutgers, Johns Hopkins and Virginia Polytechnic Institute. Among phenomena produced by supersonics are: orientation, coagulation and dispersion of dissolved, colloidal and suspended particles, chemical changes; degasification; thermal effects; and a lethal action on certain organisms. Whereas it takes 4 to 5 hr. for settling with alum, supersonics takes 2 to 3 min.

Natural recharge is the return of water from precipitation or from streams or lakes to ground water reservoirs through outcroppings of permerest in able rock formations. Maximum natural recharge is achieved by resting well; in the winter, when surface water is cold enough for cooling, and by circulating water over cooling towers, thus limiting withdrawal from wells to makeup water

requirements.

Solution: Put water ground

Substant.

Lat walls

Artificial recharge is another means of putting water back into the ground. In California, the water spreading method of artificial recharge back in has been used successfully. Water from streams is contained in ditches, furrows or basins and spread over porous sand and gravel soils, whence it percolates into the ground. To return water to the ground, a stream has been ponded near Du Pont's Parlin, N. J., plant. This has increased the yield of wells from which 10 mgd. is pumped.

Where an impermeable layer covers the waterbearing formation, water must be recharged either through old shafts or wells, or through newly drilled ones. In Long Island, N. Y., there are now over 300 recharge wells, returning a total of 60 mgd. of water that has been used for cooling to the ground. Recharge with purified city water has been used successfully at Louisville, Ky.

Recharge can also be induced by pumping near a stream. The ground water developments that have induced recharge from the Ohio River at Parkersburg, W. Va., Louisville, Ky., and Charlestown, Ind., are outstanding examples of this type of artificial recharge.

Water put back into the ground must be uncontaminated and free from silt and minerals that clog the aquifer and impair the efficiency of recharge wells. Putting too much warm cooling water back into the ground raises the temperature of the ground water. Before an artificial recharge program is undertaken, it must be ascertained whether the water returned to the ground at the plant will be confined in the immediate area or flow away to be with drawn by other users. A thorough knowledge of geologic subsurface features is essential.

Chemical industries are looking more and more to surface sources to augment ground water. River infiltration, tapping of lakes and Turn from partial diversion of streams are all used increas wells to

I'wo wartime ordnance works, one on the Wabash River at Clinton, Ind., and the other on the Ohio River at Charlestown, Ind., both run by Du Pont, used horizontal Ranney collectors to induce river water to flow into the aquifer next to the river, replenishing the underground supply. The aquifer also acts as a natural slow sand filter. Six Ranney wells at the Clinton plant yielded 72 mgd. during peak operations; seven at Charlestown aver-aged 40 mgd. National Carbide at Louisville, Ky., has a single infiltration collector. In West Virginia, Connecticut and elsewhere, other

plants also employ river infiltration. To get water for its Whiting, Ind., plant, Carbide & Carbon ran an intake pipe 700 ft. out into Lake Michigan and put in an automatic pumping station. At Painesville, Ohio, Diamond Alkali takes 100 mgd. and Industrial Rayon 30 mgd. from Lake Erie. At Ashtabula, Ohio, Union Carbide's Electromet Division gets 7 mgd. from Lake Eric, and National Distillers will soon be pumping 5 mgd. into its new sodium plant. When water requirements at its Avon Lake, Ohio, plant exceed the present supply, Goodrich also will pump directly from

Lake Erie.

At a cost of \$1 million, Celanese in 1947 strung a 26-mi. pipeline to the Nucces River to bring surface runoff water to its Bishop, Tex., plant. Celanese also built a reservoir to hold a five to seven day supply of water. To bring Brazos River water 35 mi. to Texas City, Pan American Refining and Carbide & Carbon each chipped in over \$1 million. The canal they had dug can carry more than 275 mgd. A mile-square reservoir has been built.

To conserve fresh water, coastal chemical plants use sea water for cooling. That means higher fixed costs for corrosion-resistant equipment, but operating economies often compensate for this. Recirculated fresh water can be bottled up in a closed system and cooled with sea water. Thus a smaller treating plant suffices to condition the fresh water. At its Fernandina, Fla., pulp mill, Rayonier backwashes with sea water to regenerate sodium zeolites in its Permutit-designed softening plant.

Conversion of sea water, either by ion exchange or distillation, is still costly. But the wartime developments in vapor compression distillation have significantly pushed costs down. It has even been suggested that nuclear fission might provide heat energy for distillation. Compression stills are made by Cleaver-Brooks and Badger.

The advance from the single-effect evapo rator of years ago to the vapor compression still has resulted in a large reduction of the heat required per unit of water produced. An old oilfired boiler with single-effect evaporators produced 0.655 lb. of water per 1,000 Btu.

Selution rivers and lakes

Salution

Salution distilled sea water is costly.

driven vapor compression evaporators may produce in excess of 10 lb. of water per 1,000 Btu. It is now possible to get 1,000 gal. of makeup water by distillation at a total cost of less than 50c., compared with costs of two or three times that amount.

These Kleinschmidt stills are built by Badger under a licensing agreement with Arthur D. Little. According to the Badger engineers, the largest single Kleinschmidt unit which may now be built would distill 1,500,000 gal. of sea water every 24 hr., turning out 1,350,000 gal. of fresh water and 190 tons of saturated salt solution. Value of the salt could be deducted from power costs. If electrically operated, this installation would cost from \$1.5 million to \$2 million, require 130,000 kwh. and employ 14 men per 24 hr. Fresh water, it is estimated, could be made at a cost of from 20c. to 30c. per 1,000 gal., including amortization of the plant in 20 vears.

Already employed in pharmaceutical plants, these compression distillation processes produce a pyrogen-free, disinfected, distilled water, with a negligible content of total dissolved solids and gases. The future may see more economical techniques for sea water evaporation. At present, however, these procedures are best suited to special purposes and are not competitive with

most fresh water sources.

Du Pont, missing no bets, uses all these methods. Water supply is a determining factor in locating a Du Pont plant. Company experts fine-comb proposed plant sites, investigating all sources of water, checking water quality and temperature. They ransack USGS data. First thing they look for is a lake or river-surface water. No plant goes up unless there is enough water for present operations and future expan-sion. Where feasible, Ranney wells are installed. Du Pont plants employ refrigeration, cooling towers and recycling. Raw, cooling, cooling towers and recycling. process, boiler feed, sanitary and fire protection waters move through separate mains. Treating and purification in the many plants run the gamut of known methods. Du Pont recharges water at several locations. At coastal plants, sea water is used for cooling and to supplement fresh water. One Du Pont plant, where water quality is highly critical, now has in operation a Kleinschmidt still.

Solution: governm't dams and reservoirs

Du Pont

Long-distance transfer of water, use of storage lakes and the building of big dams and reservoirs, while not usually undertaken by industries, are other means of securing and maintaining water supplies. Here the municipalities, states and federal government step in. Los Angeles, for example, spent \$220 million to bring Colorado River water more than 300 mi. from Parker Dam. Ohio, with some 400 reservoirs already, plans more. To out-Bunyan the fabulous Paul, the U.S. Bureau of Reclamation now proposes its \$3 billion basin development plan for California's Central Valley. ing the multiple-purpose philosophy to the entire basin, the bureau envisions 38 reservoirs, plus dams, power plants, transmission lines, pumping stations and hundreds of miles of transfer canals. This plan would conserve the water resources of the San Joaquin and Sacramento

Rivers and of the Central Valley Basin as a

In certain areas where chemical manufactur- Solution ing is concentrated the safe yields of the aqui-fers have been exceeded and the available reservoir sites utilized. So some chemical industries in those areas may have to move to places where they can get enough water.

These industries need plenty of cold ground water of good quality and abundant surface water to conserve the thermal value of the ground water. They are looking for places not already overcrowded by other manufacturing

plants.

Where could these chemical enterprises go? There are not too many places left. In the western and west central states, the normal flow of most streams is fully appropriated, chiefly for irrigation. In the Midwest and the East, most streams are already used and many places are plagued by industrial pollution problems. the East, many areas are in critical need of more water. In World War II plans for at least 300 military establishments and war industries had to be modified or abandoned be-

cause of water shortages.

However, there are still some attractive possi-bilities. In New England, Maine and New plo Hampshire have good sites. Around the Great Lakes, the Buffalo-Niagara Falls area has abundant water, and the fame of Ohio's Ashtabula-Painesville axis as a chemical manufacturing center is spreading. The Ohio River Valley can accommodate more chemical plants. Mississippi Valley above the Embayment has many likely spots. There are advantages in the Southeast, where the Atlantic and Gulf Coastal Plains have moderate to abundant water supplies. A glaciated state like Michigan has plenty of water. Wisconsin, where many paper mills are now located, has the makings of a future chemical center-surface water and good quality ground water. The Pacific Northwest, with its Columbia River Basin, its productive glacial deposits in Washington and Oregon, and its heavy rainfall, is rich in water resources.

Not all of these possible plant sites are equally inviting, however, when factors other than water supply are considered. Some chemical enterprises undoubtedly will move to new locations. But no wholesale migration of the chemical industries to different parts of the country is likely. For makers of chemicals who elect to stay put, there is an alternative. Where the geographic and economic advantages warrant it, water may be imported from considerable distances as is being done in southern Cali-fornia. Industries must be located where the unused water occurs or the water must be transported to the existing industrial centers.

Either way, it costs money.

Water costs are creeping upward. Today, Cost of free-flowing water, cold and of good quality, to water is be obtained at low cost, is extremely difficult climbing to find. Sometimes it is harder to find a good water supply than it is to find other raw materials or labor. Bringing in experts to prospect for water, often advisable, also adds to the bill. The value of an abundance of good water is reflected in the selling prices of plant sites that

have such supplies. Elaborate engineering techniques now required to procure, conserve and treat water are significantly increasing costs. Meantime, new processes, the thirsty colts of the chemical industries, are coming to the trough.

Wh cost is climbing

The rising cost of industrial water procurement is also related to the substitution of surface water for inadequate ground water supplies. For one thing, storage reservoirs may have to be built. Moreover, when surface water is substituted for ground water, treatment of process water becomes more expensive. Expenditures for water have increased at the Bishop, Tex., plant of Celanese because of the change two years ago to surface water. Right now, 1,000 gal, of water delivered to the Celanese plant costs about seven times as much as 1,000 cu. ft. of natural gas.

In the past 20 years, treating costs have more than doubled. One company had to spend \$14 million for a waste disposal installation after its plant was in operation. Increased costs of water processing, which include that of treating the wastes discharged to the watercourse by municipalities and industries upstream, have made maximum use of the processed water essential. Also, the high costs of constructing and operating a waste treatment plant have led to concentration of industrial wastes in the smallest amount of water, except where treatment proc-

esses require dilution.

Legal restrictions on the use of water will limits increase. State water laws, first passed in the West and Southwest, are now being enacted in the Midwest and East. Laws governing prior rights to water, withdrawal of ground water and pollution of streams are already on the books. Inevitably, there will be more. For the states are alarmed by depletion of ground water due to heavy pumping. Pollution of ground water reservoirs is serious too, because ground water moves so slowly that pollution, once introduced into a reservoir, may persist indefinitely. Many streams, especially in the East and Midwest, are so badly polluted that they are unusable. Several states have pollution control programs. And now, of course, the federal pollution abatement law is in force.

It's the

Legal

Arizona recently enacted a ground water con-Low trol law, thus becoming the eighth state to have such a statute. New Mexico's law calls for drilling permits and plugging of wells that leak. A New York law requires that for every well sunk to get water for air conditioning in the four Long Island counties, which include Brooklyn, another must be used to return the water to the ground. New Jersey now allocates underground water to industries by granting or withholding drilling permits. Pennsylvania has similar legislation under consideration. As a result, the Texas Co., which has drilled wells in the Camden-Philadelphia area, may not be able to keen taking water. Virginia's new water control act is making things tough for industries already

Reprints of this report are available at 35c. per copy. Address the Editorial Department, Chemical Engineering, 330 West 42nd St., New York 18, N. Y. there and squeezing out newcomers. In Indiana, unless he gets a special permit, a single user taking more than 200 gpm. from the ground for cooling or air conditioning must either circulate the water through cooling towers or other devices and use it over or return it to the ground

through recharge wells.

More and more the chemical process indus. Steps are tries are coming to realize that all water is critical. Water supplies have to be investigated and surveyed as diligently as other raw material Today, the chemical industries call supplies. in specialists to survey water supplies at potential plant sites, something they have not always done, often to their regret.

The activity of these industries in organizing research groups to study water supply and waste treatment problems is an indication that they are becoming extremely water conscious. Take Du Pont. It has a corps of water specialists whose full-time job it is to keep abreast of the latest developments and improvements in water procurement, treatment and utilization. These men tap all sources of information, particularly the invaluable USGS reports.

As evidence of their concern about water, look too at the way the chemical industries are cooperating with government agencies. They are supporting state and national programs to abate pollution and to conserve water.

One of these programs is the intensified study of ground water hydrology and its application to specific areas. This is vital if exact information on our ground water resources is to be secured. The problem is to determine where our ground water supplies are perennial and reliable and where they are being exhausted, like the oil fields, with diminishing yields and salt water encroachment ahead.

Integrated programs to control not only Long ground water depletion and stream pollution rouge but also flood damage and soil erosion are objective needed. A fundamental program of soil conservation can minimize silting and reduce the hazard of flash floods. Such a program should precede the building of dams and reservoirs. Otherwise, expenditures for reservoir go up.

Pollution can never be eliminated, but it can be controlled. Greater use of surface water from our streams will require intensified effort to control the dumping of polluted wastes into

What is evolving is an integrated regional approach to the development and conservation of our water resources. The all-purpose develop ment is winning out over the project devoted to a single purpose, such as flood control or irrigation. Typical of this geographic pattern are the river basin programs, in which federal agencies play big parts.

Satisfying the water requirements of the chemical industries, therefore, while an enormous undertaking, is still only part of the over-all job. For the most effective solution of our national water problem can come only through the close cooperation and coordinated effort of all interested groups, most certainly including the chemical industries, working toward the achievement of a common objective-ample water for all

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Fatty Acid Production

Article on page 92

This new plant of General Mills at Kankakee, Ill., produces fatty acid products from a variety of different natural oils. Total output is some 30 million pounds of

finished products each year.

The operation consists first of hydrolysis of the oils to fatty acids. This is done in two ways, first a continuous hydrolysis conducted at high pressure in a single column. An alternate process at this plant (not shown on the flowsheet) is the Twitchell hydrolysis, which is catalytic and operates at low pressure.

The resulting mixture of fatty acids and water containing glycerine is then separated, in both hydrolysis processes, by the difference in specific gravity. The water-glycerine mixture is concentrated by evaporation under vacuum and the

crude glycerine so produced is sold.

Following hydrolysis, the fatty acid product is separated into several cuts in a series of three continuous distillation columns. The columns operate under high vacuum and must be heated with Dowtherm to reach the high tem-

peratures involved.

These fatty acid products may be packaged and shipped as such or they may receive additional processing. The first such processing consists of hydrogenating the unsaturated bonds in the acid chain. This operation is conducted batchwise in a pair of high pressure converters. Hydrogen, of better than 99.75 percent purity, for the reaction is produced in a Girdler unit by reacting propane with steam (Chem. & Met., May 1946, pp. 162-5). Catalyst for the hydrogenation is reduced nickel.

The plant also contains an esterification unit for production of drying oils. In these kettles, either an unhydrogenated or hydrogenated fatty acid cut is reacted with a polyhydric alcohol and the resulting water formed in the reaction is distilled off, leaving the finished oil.

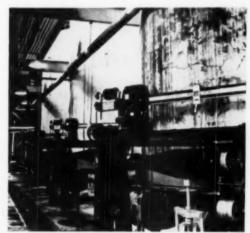
Most of the production of the plant will be shipped in tank cars, although equipment is installed (not shown on the flowsheet) for flaking and bagging products which are shipped in solid form.

are supper in some room.

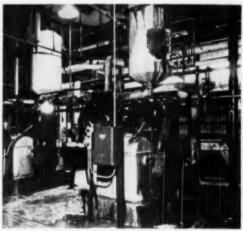
CHEMICAL ENGINEERING . JULY 1949 . PAGES 128-131



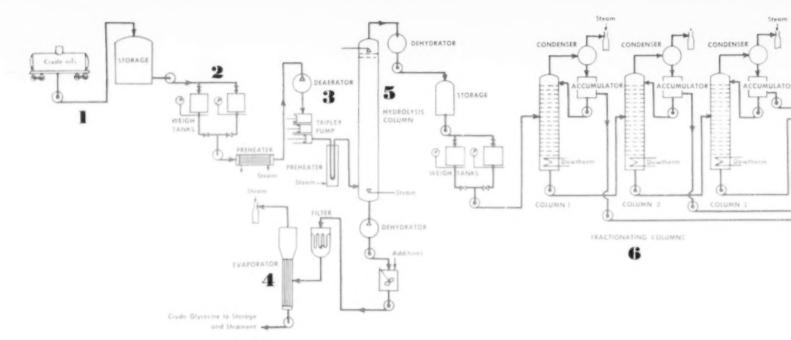
Raw material oils are stored in these steel, heated tanks after unloading from tank cars at the right.



Oil charged to the hydrolysis unit is weighed out in these weigh tanks, alternately to get continuous flow.



Oil from the weigh tanks is pumped by these triplex pumps to the continuous hydrolysis column at 800 psig.

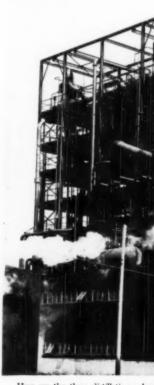




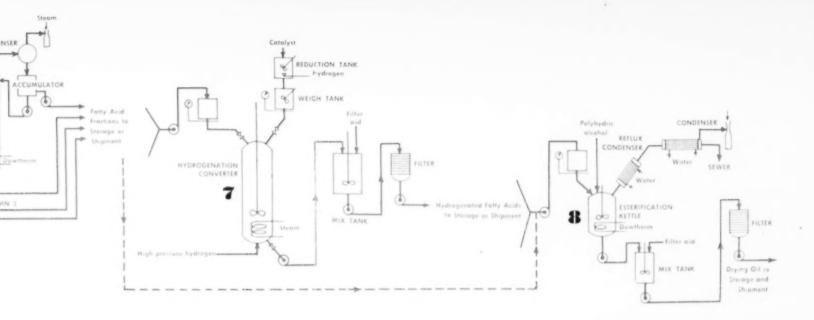
In these copper evaporators, the glycerine-water solution from the hydrolysis step is concentrated under high vacuum to crude glycerine.

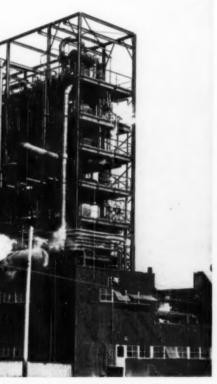


Above is the continuous hydrolysis column, some 3-ft. in diameter and 70 ft. high. It is lined with Inconel for corrosion prevention.



Here are the three distillation column fatty acid stream into four cuts. T

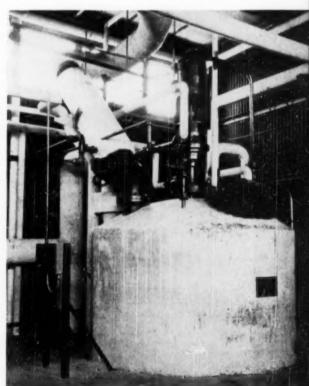




distillation columns which continuously separate the to four cuts. The columns are stainless, plate-type.



Above are the two hydrogenation converters, which operate batchwise. Hydrogen enters at the bottom of the agitated, stainless vessels.



8 This is one of the two stainless esterification kettles. The reflux condenser is shown above the kettle at top left.



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Process Equipment News

THEODORE R. OLIVE, Associate Editor



CONTINUOUS OPERATION: Solids Mixer

The Entoleter Division of the Safety Car Heating & Lighting Co., P.O. Box 904, New Haven 4, Conn., has introduced a modification of the original Entoleter designed specifically for the instantaneous mixing of solids. The original machine was intended for killing insect infestation in grains and similar materials. The modified machine consists of a horizontal impeller-like rotor driven by a vertical motor and inclosed within a specially shaped ring.

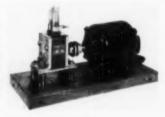
Marshall and Stevens Indexes of Comparative Equipment Costs

(1926 = 100)

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chengo and Lee Angeles, conserved the engineers of the engineers of the engineers of the related process and four related hunstries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, Chemical Engineering, Nov. 1947, pp. 124-6, For a listing of annual averages since 1942 see Chemical Engineering.

Industry	June 1948	Mar. 1949	June 1949
Average of all	160.5	165.1	160.6
Process Industries			
Coment mfg Chemical Clay products Class mfg Paint mfg Paper mfg Petroleum ind Rubber ind Process ind avg	153 9 161 9 148 9 152 0 155 2 155 5 158 3 169 7 159 2	159, 5 167, 5 154, 5 157, 6 160, 8 161, 1 163, 9 166, 3 164, 9	155 9 163 9 150 9 154 0 157 2 157 5 160 3 162 7 161 4
Related Industries			
Elec. power equip. Mining, milling Refrigerating. Steam power	163.5 162.6 173.3 150.6	169.1 168.2 181.2 156.2	165.5 164.6 174.8 152.6

The standard rotor consists of two steel disks spaced over 1 in. apart by specially designed impactors. The material entering the inlet of the ma-chine is fed by a distributor to the center of the rotor and spun out by centrifugal force into a thinning film as it approaches the perimeter of the rotor, whence it is discharged uniformly through a hopper to the outlet. The peripheral speed of the rotor is in excess of 12,800 fpm., thus subjecting the material being processed to severe impact, both within the rotor and as it leaves the rotor. Almost instantaneous mixing is thus produced with improvements in color and physical characteristics in the case of pigments, plastics, and similar powdered chemicals. The device is now being used by several chemical companies and many new applications are being investigated.



VALVELESS, SELF-PRIMING: Flexible Pump

Vanton Pump Corp., Empire State Bldg., New York 1, N. Y., has redesigned the Flex-i-Liner pump described in our issue of February 1948, so that the flexible lining element is now completely inclosed, whereas formerly it was exposed at its top. In this pump the actuating element is a rotating eccentric inclosed within a flexible liner which completely seals the metal of the eccentric portion from the fluid space. The liner is gripped tightly at the ends against the body block. The liquid or gas pumped comes only in contact with the liner and the molded hard rubber or plastic body block. The pump requires no priming, has no glands or stuffing boxes, no gaskets, and no check valves. Rotation of the eccentric rotor causes a "squeegee" action. Maintenance is said to be extremely simple. The pump is compact and requires no lubrication except the application of a special pump oil to the inner surface of the liner at the time of its replacement.



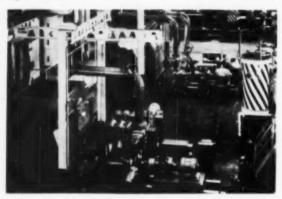
EASY THITTNG: Drum Rack

Mefford Chemical Co., 1026 Santa Fe Ave., Los Angeles 21, Calif., has developed the Sullyvan dru'n rack with which one person, it is claimed, can easily raise a drum to pouring position. The novel feature is that the rack has three separate points used as fulcrums in raising the drum, whereas other racks having curved frames are said to require two men to bring the drum up into position for dispensing.



SELECTEANING: Pressure Leaf Filter

Hercules Filter Corp., 204 21st Ave., Paterson, N. J., has introduced a 48-in. rotating leaf filter. The leaves are center-hung on a rotating shaft and provision is made for flushing away the sludge and used filter medium with sprays, without opening the door of the filter at any time. Intended primarily for water filtration, the filter may also be used for some light aqueous solutions. During the clean-



PUMP TEST FLOOR IN SERVICE

At its West Allis Works, Allis-Chahners Mfg. Co. has just put into operation a new centrifugal pump test floor designed to give maximum testing accuracy with minimum testing time and expense. This will permit complete performance data to be obtained on every pump built. A Baldwin electric straintype torque meter, combined with a new accurate speed measuring device gives the pump horsepower, while the water handled is measured with weigh tanks rather than weirs. All factors are recorded continuously. Numerous features are provided for facilitating the set-up of tests so that it is expected that time and labor for 'esting will be cut at least 60 percent.'

ing operation the leaves are rotated slowly and water is sprayed on both sides of the screens, removing the sludge and exhausted filter medium, which are drawn off from a sump at the bottom. For this purpose, a motordriven screw conveyor can be provided if necessary. With normal clarification, however, the screw is not needed.

Rotation of the filter leaves is by means of a motor-driven worm gear at the back of the filter. Discharge of filtered liquid is through the center shaft which passes through the back of the horizontal filter tank. For assembly purposes the leaves are slid over the discharge pipe which is perforated to take the discharge from each individual leaf. Pre-coating of the filter leaves requires only 2 to 5 min. before actual filtration starts.

NOVEL PRINCIPLE: Seatless Piston Valve

Klingerit, Inc., 20 Hudson St., New York 13, N. Y., has announced the new Strahman valve which is suitable for temperatures all the way from –125 deg. F. to +750 deg. F. The valve employs a radical departure in closure principle. A stainless steel piston sliding into a ring effects closure through the use of a long sealing sur-

face. The ring, which is usually made of laminations of compressed asbestos, is also available in materials suitable for hard-to-hold liquids or gases. The ring may be further compressed against the piston by a take-up on the bounet while the valve is in service. This ring is readily replaceable for maintenance.



ACCURATE SIGNALING: Electric Temperature Switch

Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn., has added a further development to its line of Microsen control equipment in a new thermal switch which operates from a thermocouple input, to signal accurately temperature variations in heating processes. The signal output is given by electrical relay action. The device is available in four standard ranges of 100-600, 100-1,000, 400-1,600, and 800-2,000 deg. F. The fixed differential is less than 2 percent of the calibrated range. Temperature settings within any of the ranges mentioned can be made by a simple knob and pointer.

For control, the device is capable of switching 10 amp, at 115 volts a.c., or 32 volts d.c., directly for temperature settings from 100 to 2,000 deg. F. For larger electrical loads, intermediate relays are required. The device is applicable to on-and-off control of electrically operated valves, warning signals or motors. It is designed for fail-safe operation, the relay circuit opening in the event of any part failing to operate properly.



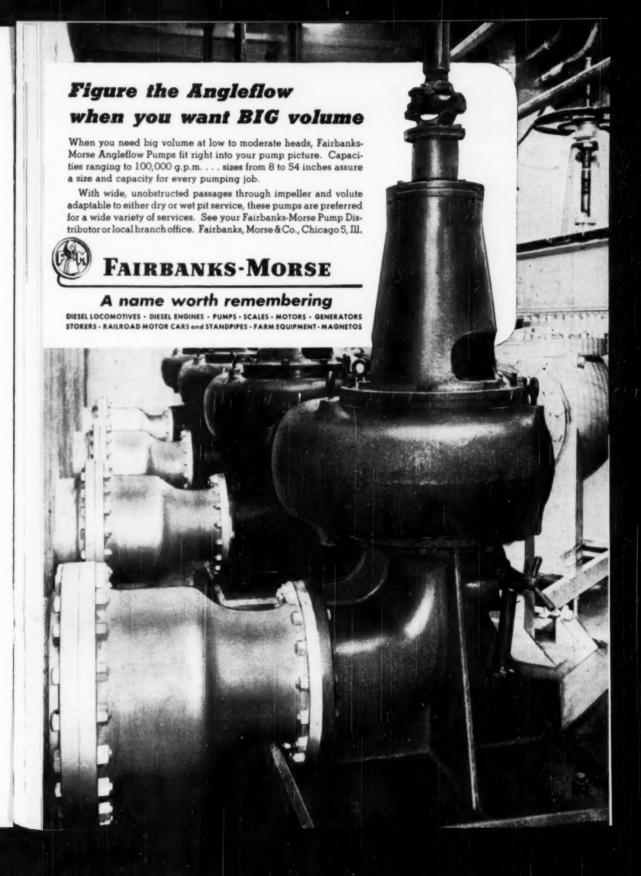
CORROSION-RESISTANT: Stainless Gate Valve

The Cooper Alloy Foundry Co., Hillside, N. J., has developed a new compact stainless-steel, union-bonnet gate valve available in sizes of \(\frac{1}{2}\), \(\frac{2}{2}\) and I in, to meet requirements where a small simple stainless valve is needed. Construction features include a union-bonnet design for simplified maintenance, a ball-and-socket point-contact disk which adjusts itself in any position, and a minimum of six turns of packing to assure effective sealing.

NON-CONFACTING:

Beta Ray Thickness Gage

General Electric Co.'s Special Products Division, Schenectady, N. Y., has introduced the Beta-Ray thickness gage, an instrument for continuously measuring the thickness of moving sheet materials without contacting or disturbing the material. The instrument measures the amount of beta (Continued)



NICHOLSON STEAM TRAPS

Operate on Lowest Temperature Differential to STOP

Waterlog Loss



Wherever back-up of condensate is a problem Nicholson steam traps are increasingly specified. They are universally recommended for eliminating "cold blow" in unit beaters. Plant records show production of cooking kettles increased as much as 30%. 5 types for every application. Size 1₈" to 2"; press. to 225 lbs. BULLETIN 1047.

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NEW EQUIPMENT, CORE. . .

rays absorbed by the sheet material, thus indicating the mass per unit area of material under test. However, the instrument can be calibrated in terms of thickness to help operators achieve product uniformity. The gage is suitable for both metallic and non-metallic sheet materials and is particularly indicated for use where the sheet must be free from contact during processing. The instrument employs stoutium 90, a radioactive isotope, as the source of beta rays.



INEXPENSIVE: Light Duty Screen

The Screen Equipment Co., Buffalo 21, N.Y., has introduced a new line of light duty vibrating screens known as the Mighty-Mite. Offered primarily for small screening jobs often performed by hand, the screen is made in single- and double-deck models, in widths of 1½ to 2 ft., and lengths from 3 to 8 ft. Triple deck models are made in still smaller sizes. Vibration is of the positive eccentric type, with a maximum amplitude of $\frac{\pi}{6}$ in. These screens operate up to 1,150 rpm., and require only 1 to 2 hp., handling loads up to 15 fens per hr., depending on the material and the screen size.

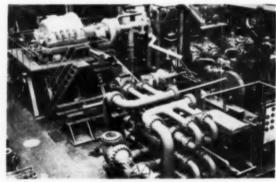


NON-CONTAMINATING: Hard Rubber Filter

The Ertel Engineering Corp., 50 Front St., Kingston, N. Y., has developed the EUR hard rubber filter, said to be the first of its type available to industry. It provides a complete circulatory passage of hard rubber, thus preventing figuids from coming in contact with metals. Its use is particularly indicated in the beverage, chemical and drug fields where metallic pick-up might be harmful to the product. The filter is produced in sizes from a 10-disk model with 2.350 sq. in. of filtering surface, to a 100-disk model with ten times this area.

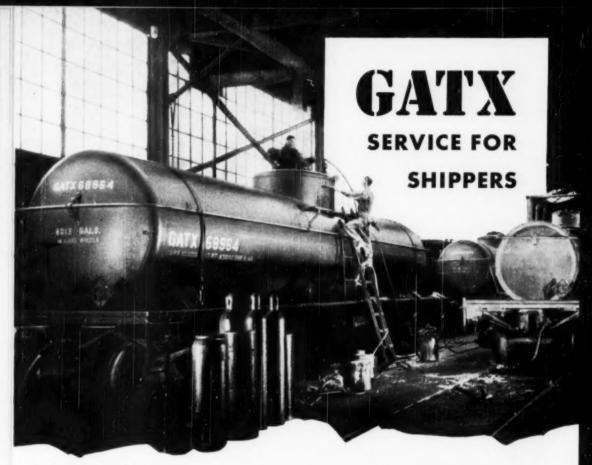
The 16 x 16-in, filter sheets used are identical to those used in similar bronze and stainless steel filters. On liquids similar to water in viscosity,

(Continued)



OXYGEN PLANT COMPRESSORS TESTED

Clark Bros. Co., Olean, N. Y., is using this test set-up for checking performance of the four-stage centrifugal compressors to be supplied to the Hydrocol oxygen plant at Brownsville, Tex. Three such compressors, group driven by a 23,000-bhp, steam turbine, will furnish the main air supply for each of the two 1,000-ton-per-day oxygen units. Axial compressors and gas turbines will also be tested here.



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The GATX reporting mark identifies the General American fleet of more than 40,000 tank cars of 207 specialized types. This fleet, built in General American's own plants and serviced by General American's shops and offices everywhere, continues to give shippers the safe, economical transportation of bulk liquids they need.

General American's maintenance shops, located throughout the country, keep GATX cars rolling.

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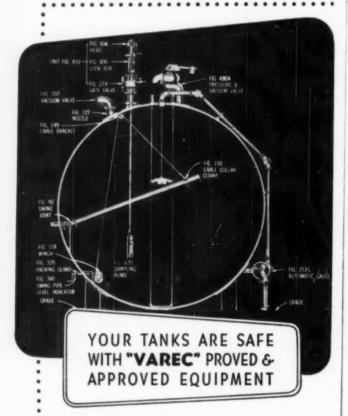




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NEW EQUIPMENT, cont. . .

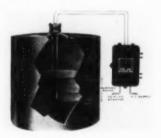
capacities range from 5 to 50 gpm. The outlet frames of the filter are designed to eliminate any breakage of the sheets, while the sheets provide a positive seal without rubber washers. The filter can use either paper or asbestos filter sheets and can, if desired, be provided with this company's Model G plastic pump.



PROVIDES HEATING OR COOLING:

Jacketed Gear Pumps

Viking Pump Co., Cedar Falls, Iowa, has introduced a new line of jacketed pumps in sizes of 90, 200, 300 and 450 gpm. These pumps are available in various combinations, including the bare pump, and pumps with various sorts of drive. Complete individual jackets of generous size are provided for the casing, head and rotor bearing sleeve, suitable for either cooling or heating (up to 125 psi, steam pressure). Jacketing of the rotor bearing sleeve permits the packing to be heated to retain its pliability and prevent liquid being handled from hard-ening and solidifying in the packing box. Such pumps are made in all-iron, bronze-fitted and steel-fitted constructions. They are intended for handling both heavy, viscous materials which, require heating, and volatile liquids which may need cooling.



Liquid Level Control

Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass., announces its Series 10 level control, specifically for use in chemical and food processing. The device has no floats or moving (Continued)

All you Want-B&W CARBON STEEL TUBES

SEAMLESS () WEIDED
HOT FINISHED HOT MOLLED
COLD BILLWIN COLD HOLLED

MECHANICAL TUBING STILL TUBES BOILER TUBES CONDENSER & HEAT-EXCHANGER

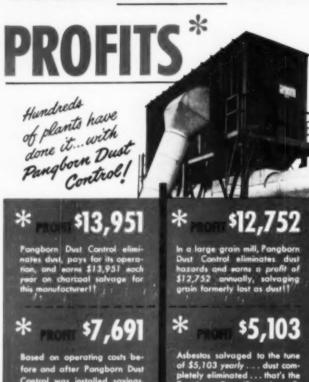
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DUST CONTROL

NEW EQUIPMENT, cont. . . .

parts within the tank and utilizes a pair of stainless steel probe rods in a probe circuit consisting of a transformer, rectifier, and electrical relay. No vacuum tubes are required. Operation is independent of temperature and pressure, and the adjustable sensitivity of the electrical circuit is said to make it possible to match the resistivity of the liquid being controlled and to distinguish satisfactorily between the liquid and its foam. device consumes 0,5 watt and can operate on 115 or 230 volts alternating current.



STOPS WATER HAMMER:

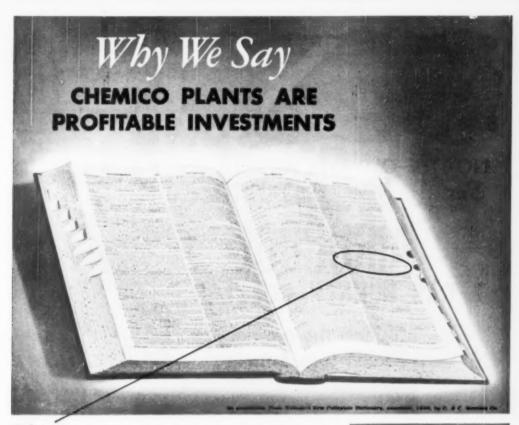
Sealed Air Chamber

The Wade Mfg, Co., Elkin, Ill., has developed a permanently sealed air chamber to eliminate the damaging effect of water hammer, Known as the ShokStop, this device is said to have survived 60,000,000 water hammer cycles in tests, without servicing or maintenance. The new device consists of a chamber containing an ingeniously fabricated metal bellows which allows free contraction and expansion of the air sealed within it, but prevents all contact between air and water. The device is said positively to prevent water-logging of the air chamber, such as often occurs in ordinary capped type air chambers.

MANY TYPES?

Single-Phase Motor

The Louis Allis Co., Milwaukee 7, Wis., has recently put into production a new line of integral-horsepower, single-phase motors with many new features of design. These motors are built in capacitor-start, induction-run types in ratings of 1 and 14 hp., and in capacitor-start, capacitor-run types in ratings of 2, 3, 5, 7½ and 10 hp. They are available in open dripproof, splash-proof, totally inclosed, fau-cooled and explosion-proof con-structions. The centrifugal switch formerly used to disconnect the starting (Continued)



Webster dennes an investment as "the investing of money or capital for income or profit." In the heavy chemical field, Chemico is a proved translator of investment into profit. Here's why:

Every Chemico-built plant is planned and designed to fit individual needs.

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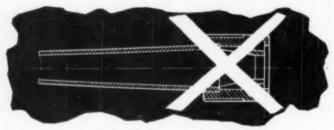
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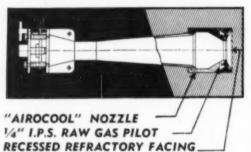


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"AIROCOOL" GAS BURNER NOZZLES

...outlast the ordinary nozzle 2 to 5 times



Our "AIROCOOL" Notates have the "earned" reputation of outlasting under fire, two to five times, the ordinary inspirator gas burner nosales. Consequently, they reduce the frequent labor costs, inconvenience, and overhead item of making replacements.

Renewable type recessed gas tips direct the separate igniter flames against the main volume of the mixture to insure stable

ignition . . , and allow greater turn-down without burn-back.

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INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

NEW EQUIPMENT, cont. . .

condensers from the line when the motor comes up to speed has been replaced in the new line by a voltage relay. This relay is mounted in the control cabinet furnished with the motor, which also includes an across-the-line starter and the necessary capacitor. This makes it possible to remove the capacitor inclosure from the motor itself, which is often advantageous on account of heat and vibration. The motors are identical in appearance to polyphase motors of the same inclosure and type.



Repeat Cycle Timer

G. C. Wilson & Co., Chatham, N. J., is offering a new electronic repeat cycle timer employing one radio type vacuum tube. The instrument obtains its timing intervals by charging of two resistance capacitance networks. Operation is such that one cycle initiates the next cycle without any moving parts or external operation. The off-and-on cycles are infinitely variable within the ranges of 0.2 to 200 sec. on, and 0.1 to 60 sec. off. Longer or shorter intervals can be provided if desired. The double-pole, double-throw contacts will handle 10 amp. at 115 volts.

GUARDS STACKS: Smoke Density Indicator

General Electric Co.'s Control Divisions, Schencetady, N. Y., have developed a new smoke density indicator and control, designed especially to indicate industrial smoke density levels and thus facilitate compliance with smoke abatement ordinances. The device can also be used to control overfire heated air to the fire box, to reduce smoking and thereby improve boiler efficiency. It consists of a light source, phototube holder and an inclosure containing the required control. The indicator is calibrated in Ringlemann units. A recorder can be (Continued)

July 1949—CHEMICAL ENGINEERING

Announcing PENNSYLVANIA CRUSHER COMPANY

N OF BATH IRON WORKS CORPORATION

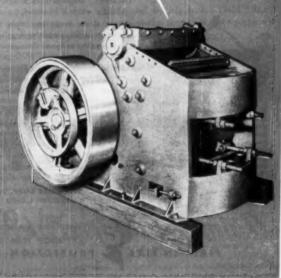
New York • Pittsburgh • Chicago • Los Angeles • Birmingham—Associated with Fraser & Chalmers Engineering Works, Londo

Exclusive Eastern Manufacturer and Distributor of . . .

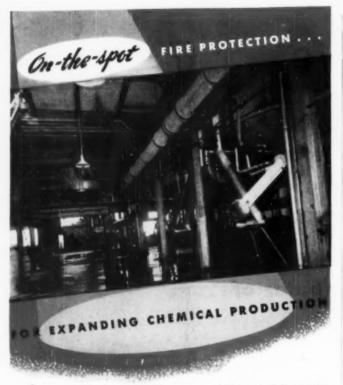
KUE-KEN JAW CRUSHERS

... Crushing without rubbing

Here is the one jaw crusher that "crushes without rubbing." The Kue-Ken crushes by pressure only, with no rubbing and minimum abrasion. The motion or path of travel of the jaw plates is squarely against the rock, instantly gripping and crushing without any rubbing action. Kue-Ken Jaw Crushers meet the most difficult crushing requirements of mine, quarry and industrial plant in a manner that sets them far apart from ordinary jaw crushers. Send for bulletin No. 5011.



Manufecturers of a complete line of crushing equipment . Hammermills . Single Rolls . Bradmills . Jaws . Gyracones . Granulators . Impactors . Bradford Breakers



N many of the chemical processing industries, standard methods of fire protection alone are not sufficient to combat fast spreading fires such as occur from spillage, leaky flanges, cracked fittings and the like. Special attention must be given to areas particularly vulnerable to fire, and on record llulomatic FME FOC is the tested and proved method. It's on-the-spot protection, designed to detect fire fast . . , extinguish or control fire instantly.



Unformation of the Uniformation of the Uniformation of Territory Family provides besic fire protection for process equipment and storage in the chemical and petroleum industries. On the spot protection for quench tanks, dryers, explosive hazards, conveyor openings, air filters, oil filled electrical equipment and other units vital to production line operations.

The inherent danger in chemical barrelling operation, like that which is illustrated, is readily recognized. Fire in the danger area might easily cause control valves to fail, permitting large quantities of ignited flammables to spread throughout the building. But with Automatic FIRE-FOG protection, fire has little chance to gain headway. Flames are instantly detected; and there's no escaping FIRE FOG's automatic deluge of mist fine water spray. It beats down the blaze, drives out the oxygen, smothers the fire. Damage is confined to the point of fire origin and out-of-service time is held to a minimum.

Isn't now the time to investigate the fire combatability of your plant protection? Your nearest Culomatic FIRE FOG representative will be glad to assist with your planning, furnishing surveys and estimates upon request ... no cost or obligation of course.

"AUTOMATIC" SPRINKLER CORP. OF AMERICA YOUNGSTOWN I, OHIO

DEVELOPMENT - ENGINEERING

OFFICES IN PRINCIPAL CITIES OF NORTH AND SOUTH AMERICA

NEW FOURMENT, cont . . .

provided if desired. In use, a magnetic relay operates when a predetermined smoke density such as 35 percent is reached. At that point a blower forces over-fire heated air into the fire box until the smoke density drops to approximately 15 percent. Each time the density rises, an alarm is sounded to warn the boiler operator.

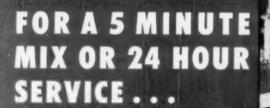


TOOLS NOT NEEDED: **Rivetless Conveyor Chain**

Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, Mich., has introduced the Type X 458 Keystone rivetless conveyor chain which may be assentbled or disassembled without the use of any tools at all. It has no rivets, welds or bolts, requires no special or joining links, and may be disconnected at any point. However, its design is such that it cannot become disconnected or telescope in service. There are only three components, the center or keystone link, the side links, and the connecting pin. Through the use of ample bearing surface, and the lock ing of the pin against rotation, the chain is said to be exceptionally serviceable in corrosive or dirty conditions, with long life assured. The improvements in this chain are largely in the design of the side link which has been given a new type of web, substantially stiffening the link. This has been ac complished without increasing the weight per foot.

CONTINUOUS, RELIABLE: Automatic Dehumidifier

Pittsburgh Lectrodryer Corp., P.O. Box 1766, Pittsburgh 30, Pa., is offering a new type dehumidification machine known as the J-150. This machine, developed originally for the U.S. Navy for use in the dehumidified warehouse program, has a removal capacity of 700 lb. of water per day from air registering 90-deg. F. dry bulb or 75 deg. F. wet bulb. Its overall measurements are approximately as follows: Width, 5 ft., length, 8½ ft., height, 7½ ft. and it weighs about 4,500 lb. It is of the dual type, employing activated alumina as the drying agent. It can be adapted to steam, gas or electricity for providing the reactivating heat, and its adjustable cycle (Continued)



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THE ACCEPTED STANDARD IN PROCESS WORK

Lightnin Portables are designed so that they can be moved quickly and easily from one job to another, or permanently installed and operated on 24-hour service. . . . Years of trouble-free service are the result of sound mechanical design and construction based on Mixing Equipment Company's unparalleled experience in the manufacture of mixers. That is why Lightnin Mixers assure the lowest possible mixing costs.

Available in air driven (1/8 to 1 H.P.) and electric driven (1/8 to 3 H.P.) models, gear and direct drive, with motors, shafts, impellers and materials of construction to meet your operating conditions.

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M.P. for use on tanks up 5,000,000 gallens capacity.

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"RED-CAPS"...fine for the traveling public...but they can mean "Red Ink" in your handling operations!



NDUSTRIAL engineers say that material handling constitutes as much as 50% of total production cost-cut handling costs and you cut production costs. Order and cleanliness-freedom from congestion - increased safety - smooth flowing coordinated movement of material or packages - these are plus advantages from Standard Conveyors in addition to their time, money, and manpower economies.

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can be tuned in for maximum efficiency under any weather or climatic conditions.

ACCURATE CONTROL: Needle Valve

Associated Valve & Engineering Co., 1150 West Marquette Rd., Chicago 21, Ill., has introduced a new stainless steel characterized needle valve for providing metered flows. The valve has a specially designed needle, a largediameter seat opening, and a Hastellov C seat insert. The stem packing is Teflon, and the body, stem and packing box of Type 316 stainless steel. The valve can be repacked under line pressure and is produced in sizes of 1. 2 and 1 in.



THREE SIZES: New Portable Elevators

Barrett-Cravens Co., 4609 South Western Blvd., Chicago 9, Ill., has introduced its new "Hundred" line of hand-operated portable elevators, available in capacities of 500, 1,000 and 2,000 lb. These general-purpose elevators are readily maneuverable, employ an improved lifting gear, and require less lifting effort than the models they replace. All models are of welded construction, with cut spur gear reduction, caster steer, and floor lock.

FOR VISCOUS MATERIALS:

Steam-Jacketed Valve

The Everlasting Valve Co., 45 Fisk St., Jersey City 5, N. J., has introduced a steam-jacketed, quick-operating valve employing the same mechanical principles that have been used in this company's standard rotating-gate valves in the past. In these valves the disk or gate slides across the ports in a rotating, self-clearing action, actuated by a quick-operating lever. The valve has been provided with ample jacket space surrounding the port openings, as well

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(in drums or tank cars)

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ENJAY HYDROCARBONS

Butadiene CH::CHCH:CH. Isobutylene-CH;:C(CH₂); Dissobutylene - CH2:C(CH2)CH2C(CH2)a+ Triisabutylene—CH₂:C(CH₂)CH₂C(CH₂);CH₂C(CH₂);t

† Other isomers also present.

CTLA POLYMER - An economical heat-reactive, aromatictype olefinic hydrocarbon. Highly unsaturated. Dries by polymerization and oxidation. Miscible in all proportions with drying oils. Compatible with most resins.



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Many times over

The Improved WILLSON LEATHER MASK SAFETY GOGGLES



The mask of high grade, soft, pliable leather fits any face and head size. And it distributes the shock of impact over a wide area. Fitted with WILLSON Super-Tough* lenses, of course, for maximum eye protection.

for Dusty Jobs

Style DL48

Indirectly ventilated with four baffled and screened ports in the eyecups. They permit the entrance of air— exclude dust, grit and other flying particles.



for Hot Jobs Style DL31

Deep eyecups are well perforated to permit free air circulation to reduce fogging. Corduroy boundedges absorb perspiration. Particularly adaptable for men working under high temperature conditions in many foundry and steel mill operations.

For more complete information about these and other WILLSON eye and respiratory protective equipment, get in touch with your Wilhon distributor or write



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NEW EQUIPMENT, cont. . . .

as the body, to provide extensive heating surface and correct temperature and insure fluidity of the material being handled. The steam or other heating medium can be connected to the jacket at either side of the valve. Such valves are made in sizes of 2, 3 and 4 in., for 125 psi. line pressure and a similar jacket pressure.



FOR HAZARDOUS LOCATIONS:

Explosion-Proof Speaker

The Signet Development Co., 188 West Randolph St., Chicago 1, Ill., has developed a loudspeaker for intercomm and public address systems, for use in locations where explosive or combustible gases or dusts may be present. This speaker, said to be both flame-proof and explosion-proof, is intended primarily for use in refineries, chemical plants, and munitions manufacturing establishments. The speaker operates just as any regular loudspeaker would, except that it is said to be incapable of igniting dusts or gases surrounding it, should a breakdown in the voice coil or field coil occur.

Briefs . . .

SOUND GENERATOR. The Ultrasonic Corp., 61 Rogers St., Cambridge 42. Mass., has introduced its Model U-4 sonic generator for laboratory, pilot plant and production use in the ultrasonic treatment of process materials in the gas phase, at frequencies from 500 to 22,000 cycles per see. The unit has an output of over 300 watts and gives intensity levels up to 165 decibels. It is suitable for dust, fume and mist collection purposes, and is potentially useful in such applications as emulsion forming and breaking, killing bacteria, increasing seed germination, etc.

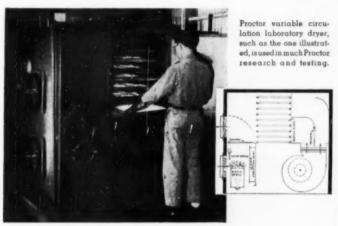
MARKERS. W. H. Brady Co., 808
North Third St., Milwaukee 3,
Wis., has introduced a line of selfadhesive pipe markers for the fast,
accurate identification of materials
carried in pipes. Each marker is
21 in. wide x 9 in. long and comes
mounted on a card 21 in. x 9 in.
The markers follow ASA standards
(Continued)



PUBLISHED MONTHLY FOR PROCESS INDUSTRIES EXECUTIVES AND OPERATING PERSONNEL

WHY PROCTOR CAN OFFER

Guaranteed Performance of Proctor Dryers



The solution of a drying problem demands thorough consideration of existent variables and a well organized approach toward establishing facts concerning them. Proctor and Schwartz pursues this principle of procedure in arriving at recommendations for Proctor dryers which are backed by a performance guarantee.

First, all essential physical data in reference to the properties of the product, handling characteristics, and plant conditions are obtained by the sales engineers. Preliminary and supplementary processing equipment is also considered in the study.

Then actual physical tests of the exact representative wet material is made in a Proctor Laboratory Dryer. Here conditions of temperature and air circulation are simulated for the particular commercial machine being considered. From these tests drying characteristics are secured. Samples of the product are submitted to the customer for quality check. In fact, it is a policy of Proctor to have a customer

representative witness the tests.

The laboratory data is reviewed by preliminary engineering and their years of experience are applied to make the correct interpretation of the data. Engineering calculations relative to the commercial design are then made in preparation of a proposal.

The proposal for the commercial machine based on the test results, is then submitted to the customer. The customer, and in many cases, the sales engineer review the study to make sure all factors relating to capacity requirements, quality and smoothness of plant processing are accomplished.

In most cases there is no charge for any research conducted by Proctor engineers.

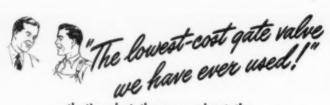
PROCTOR SUPERVISES INSTALLATION AND INITIAL OPERATION

Any system recommended will be installed under Proctor direction—and must perform according to contract stipulations before Proctor & Schwartz considers the installation complete.

This entire logical procedure is followed to assure the written performance guarantee of Proctor dryers contained in the sales contract.

Much Proctor drying equipment and textile machinery is covered in full or in part by patents or patents pending.

PRINCIPLE SOLVANO COMO CONTRA DE PARENTE DE



... that's what they say about the

LUNKENHEIMER "King Clip" Gate Valve

The first clip type valve was originally developed many years ago by Lunkenheimer and was one of the most popular gate valves ever designed. As service demands became more severe, the basic design was improved into the present "King-Clip". Twenty-one different patterns are now available for a wide range of service conditions in virtually all industries.

The "King-Clip" is truly the leader of all clip type valves...it offers you a money saving solution to many valve problems. See your Lunkenheimer Distributor. He has a stock available to serve you promptly. Write for Circular No. 561.

There are good reasons why so many valve users prefer "King-Clip" Valves. Note these features:

Exceptionally strong body and bonnet construction. Extra length pipe threads for a strong, safe joint. Sharply tapered disc seats tightly.

Large, unobstructed channels really drain the bonnet.

Coarse stuffing box threads provide greater resistance
to corrosion and stripping . . . reduce annoyance
of leaky stuffing boxes.

Easy to disassemble and reassemble.

Exceptionally low maintenance cost.

In bronze mounted patterns, rolled-in seat rings, integral non-corrodible stem thread bearing and special alloy stem assure longer life.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

CINCINNATI 14, OHIO. U. S.A.

BUSTON 15 Proc ADEL Proc 24



Fig. 1640 tron Body Bronze Mounted... for steam, ell, gas, air, water and goseline service.

Fig. 1644 All Iron ... for handling solutions which attack bronze.



NEW EQUIPMENT, cont. . .

which establish five basic background colors for identifying major types of materials carried in pipes, with the name of the specific material superimposed on the proper background color. The manufacturer is prepared to supply more than 150 stock pipe markers.

VAPORIZER, M. F. Robertson Sons Co., Philadelphia, Pa. is offering an electrically operated glycol vaporizer to assist in the control of respiratory diseases. There is now considerable evidence of the effectiveness of glycol vapors for this purpose. The vaporizer employs Fiberglas wicks to produce capillary action, in conjunction with heat generated by an infrared bulb. The device requires little maintenance other than solution filling. A single vaporizer under normal conditions of temperature and humidity is said to be sufficient to treat 3,000 to 6,000 cu. ft. of space.

RESPIRATOR. Pulmosan Safety Equipment Corp., 644 Pacific St., Brooklyn 17, N. Y., has introduced its new S-600 dust respirator, approved by the Bureau of Mines for Type A dusts. The respirator is light and comfortable, according to the manufacturer, and gives protection against pneumoconiosis-producing dusts such as quartz, asbestos, iron ores, etc., as well as all nuisance and non-toxic dusts.

East Olympic Blvd., Los Angeles, Calif., has developed a water sterilizer capable of treating 1,500 to 2,000 gal. of water per lir. at a cost of two or three cents, using the sterilizing action of Westinghouse sterilizing lamps. Where absolute sterilizing lamps. Where absolute sterility is not needed and a bacteria reduction in excess of 94 percent is satisfactory, the unit will treat 5,000 gal. of water per lir. Water produced by the unit is said to be suitable for all sterile water requirements.

ELECTRIC THERMOMETER.
Weston Electrical Instrument
Corp., 617 Frelingluysen Ave.,
Neward 5, N. J., has introduced a
resistance thermometer, Model 918,
with a direct reading indicator
which may be mounted at any reasonable distance from the bulb. The
device operates on ordinary alternating current lighting circuits, and
through incorporation of a selector
witch and multiple bulbs, can make
a number of temperature measurements with but a single indicating
instrument.
—End

groups of

money-saving dark resins

adequate in range and use

	DESCRIPTION	USES
PARADENE 1, 2, 3, 33,	Melting point from 20° to 130° C.	Used in manufacture of adhesives, con- crete curing compounds, electrical insu- lation, floor tile, linoleum, paints and lation, floor tile, linoleum, paints and varnishes, pipe coatings, textile coatings and in compounding of natural and syn- thetic rubber.
34 and 35 465	Melting point—105° to 120° C. Soluble in aromatic soluble and partially in	compounds, varnishes and in the com-
RESIN	petroleum solvents. Melting point from 80	Used in the manufacture of adhesives, binders, box toes, briquettes, composition
NUBA	Soluble in aromatic syents. They are cohes	ol- insulating blocks, ing and thermal insulating compounds ing and dressings, steep-roof coating leather compounding natural and sys

and have high molten

viscosity.

describing these resins.

#1, 2, 3X

A-32

PITTSBURGH 25, PA.

thetic rubber.

Chemicals for the Nation's Vital Industries

BENZOL . TOLUOL . CRUDE COAL-TAR SOLVENTS . HI-FLASH SOLVENTS COUMARONE-INDENE RESINS - RUBBER COMPOUNDING MATERIALS - TAR PAINTS WIRE ENAMEL THINNERS . PHENOTHIAZINE . ALKYLATED PHENOLS RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, AND SHINGLE STAIN OILS

for dyestuffs

for explosives

Monomethylamine

for photographic chemicals

for textile specialties

Monomethylamine is now available for prompt shipment. This low-priced primary aliphatic amine is a highly reactive base useful as a raw material for synthesis and as an intermediate in the manufacture of many commercially valuable compounds. Our Technical Service Division is on call to help you in the application of this useful and versatile chemical to your products or processes. Write, wire, or phone today!

properties

Monomethylamine is a flammable gas having a strong ammoniacal odor.

Molecular Weight: 31.06

Boiling Point: -6.0°C. to-5.5°C. at 768 mm. of mercury.

Melting Point: -92.5°C.

Specific Gravity: 0.699 at -10.8°C. 15°C.

Solubility: Very soluble in water and in alcohol. Also soluble in ether. One volume of water at 25 °C, will dissolve 959 volumes of monomethylamine.

Flash Point (30% solution): 0.3°C. (32.5°F.)

Weight per U.S. Gallon (30% solution): approximately 7.7 pounds at 68°F.

specifications

Purity: Not less than 98 mol % of total amines.

Concentration: 30% to 30.5% by weight in water.*

Formaldehyde: Less than 0.3% by weight of the solution.

Ammonia: Less than 0.2% by weight of the solution.

*Available in higher concentrations if desired.



COMMERCIAL SOLVENTS CORPORATION

ENDUSTRIAL CHEMICAL DIVISION . 17 EAST 42ND STREET, NEW YORK 17, N. Y. . BRANCH OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

New Products and Materials

JOSEPH A. O'CONNOR, Assistant Editor

REACTIVE:

Cyanuric Chloride

American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y., is now in pilot-plant production of cyanuric chloride. A versatile compound, this product offers many possibilities.

Cyanuric chloride is a solid melting at 146 deg. C. Its boiling point is 190 deg. C., and it is not decomposed at the boiling point. Cyanuric chloride is hydrolyzed by water, in which it is very slightly soluble. It is soluble in most organic solvents.

Possessing a high degree of reactivity, cyanuric chloride somewhat resembles a carboxylic acid chloride and the reactivity of the chlorine atoms differs sufficiently to permit the stepwise introduction of the same or different substituents. Reaction readily occurs with compounds having labile hydrogen atoms, such as amines, alcohols, phenols, mercaptans and malonic

Cyanuric chloride has been used abroad for the preparation of dvestuffs and optical bleaching agents for whitening textiles. The product also offers possibilities for the syntheses of pharmaceuticals, high polymers, explosives, rubber chemicals, mothproofing agents, surface active agents and plasticizers.

A technical bulletin detailing further physical and chemical porperties of cyanuric chloride and giving uses for it can be secured from the new product department of American Cyanamid.

MONOMERIC:

Vinyl Plasticizer

Resinous Products Division of Rohm & Haas Co., Philadelphia, Pa., is now making commercially available Monoplex DOA, a monomeric plasticizer. This product is di-iso-octyl adipate.

Monoplex DOA is produced as a distilled ester of high purity and good color. It is said to function well as a plasticizer for light and heavy weight vinyl film, supported and unsupported for organosol and plastisol compounds, for molded and extruded vinyl stocks and as a modifier for vinyl emulsions.

According to the manufacturer, it imparts outstanding low-temperature

Contents

Cyanuric Chloride
Vinyl Plasticizer
Photographic Color Film 155
Palmitic Acid
Calcium Nitrate
Alkylated Phenol
Vinvl Resin
Setocyanine Dye
Protective Film for Cork156
Oxamide
Vitamin E
Lipids
Hydraulic Oil
Heptalgin162
Ductile Cast Iron162

flexibility (Kemp bend-brittle temperature, —63 deg. C.), hand and drape, and produces films of good color, clarity, stability to ultraviolet light and resistance to water extraction. The plasticizer is also an efficient modifier for blending with resinous plasticizers of the Paraplex family, where improved flexibility and softness at low temperatures are desired.

ALL IN ONE:

Photographic Color Film

E. I. du Pont de Nemours & Co., Wilmington 98, Del., has come up with a basic improvement in photographic film. Du Pont has just introduced a new color film for the motion picture industry.

Result of many years of Du Pont research, this product is an entirely new synthetic polymer which is also a color former. It takes the place of both the gelatin binder and the color former heretofore used in color films. Combination of the binder and color former in a single material results in excellent color reproduction and improved image sharpness. This film is for the printing of 35-mm. positives for showing in motion picture theaters. This is the first Du Pont film made with the new polymer.

80 PERCENT: Palmitie Acid

W. C. Hardesty Co., Inc., Los Angeles 22, Calif., is now turning out in commercial quantities an 80 percent palmitic content fatty acid. It is known as Hardesty palmitic acid 80.

Combined properties of high melting point, low iodine value, light color and heat stability offer a variety of possibilities to manufacturers of cosmetics, esters and metallic palmitates, plastics and other products.

Hardesty palmitic acid 80 is available in quantity. Moreover, experimental quantities, together with critical data may be secured from the company.

CRYSTALLINE:

Calcium Nitrate

Monsanto Chemical Co., St. Louis 4, Mo., is now offering an improved crystalline calcium nitrate at the lowest price since before the war.

The improved crystals are of a finer size. This is an important factor when calcium nitrate is used as a coagulant in the latex dipping process. The finer size of the improved crystals permits them to dissolve faster, while retaining high purity and the low water content quality desirable for proper coagulation.

Price of Monsanto's crystals has been reduced 50 percent on orders of 20,000 lb. or more. Corresponding favorable reductions are being made on smaller quantities.

The new product is also available in alcoholic solution at reduced prices. These cuts are made possible by the new calcium nitrate and the drastically lowered alcohol schedules.

VERSATILE:

Alkylated Phenol

Koppers Co., Inc., Chemical Division, Pittsburgh 19, Pa., is now offering mono-tert-butyl-meta-cresol, a versatile organic.

Koppers MBMC, as it is called, is a light-colored liquid alkylated phenol which solidifies slightly below room temperature. This chemical displays an unusual combination of physical and chemical properties. These include a phenol coefficient of 30-50, oil solubility, mild antioxidant properties and a high degree of reactivity. Monotert-butyl-meta-cresol closely resembles thymol in structure. The isopropyl group of thymol has been replaced by (Continued)



YOU GET POSITIVE CORROSION
RESISTANCE ON ALL!

Tanks 10 ft. in diameter, 12 ft. deep—or pipe fittings no larger than your thumb. Every piece of process equipment in your plant can be made positively corrosion resistant for longer service life, lower maintenance costs. HAVEG, the strong, lightweight molded material, resists chemical action through its entire mass. Not just a lining or coating, its performance is not affected by surface gouges or abrasion.

We're sure HAVEG can help you increase equipment life—so sure that we ask you to try it. Send for samples or install a test piece. Meanwhile, for detailed engineering and application data, write for Bulletin F-5, today.

Available in complete range of sizes to meet all process equipment needs!



NEW PRODUCTS, cont. . .

the tertiary-butyl radical in MBMC. As such, MBMC will undergo most of the reactions typical of the lower alkylated phenols.

This high phenol coefficient of 50-50 makes MBMC valuable as a germicide in the compounding of disinfectants and other sanitizing products and as a preservative for protein and other materials attacked by bacteria and fungi. Among many other uses, MBMC is valuable as an intermediate for the production of rubber chemicals and lubricating oil additives, as a raw material for the production of musk ambrette for the perfume industry and as a modifying agent in the preparation of synthetic resins.

An infrared spectrogram of Koppers MBMC is included in a new 24-page technical bulletin describing the physical and chemical properties, uses and chemical reactions of this compound. Also contained in the bulletin are references to technical and patent literature, together with commercial information on storage, handling, and toxicity.

FOR WATER DISPERSIONS;

Vinyl Resin

Bakelite Corp., 30 East 42d St., New York 17, N. Y., is now making commercially available a new grade of vinvl resin, having a wide range of possible uses.

The new resin, identified as Viny-lite dispersion resin XV.4, is particularly intended for use in preparation of water-based dispersions. The ease of application and versatility of the resin suggests such uses as coating cloth to obtain tough, water-resistant materials to be used for upholstery, shade cloth and carpet backing. Paper coated with the resin should be useful in packaging applications and in the manufacture of waterproof and, hence, washable wallpaper. The dispersions also suggest coatings for various materials to be used as floor coverings.

The new resin is quite similar to the VYNV and the VYDR grades of vinyl resin used in preparing organosol and plastisol dispersions and solution coatings, exhibiting the same extreme toughness and chemical resistance. Being a dry resin from which stable water dispersions can be prepared as required, NV.4 avoids many of the problems inherent in handling the usual types of synthetic resin latices and offers greater latitude to the formulator.

Vinylite resin NV.4 can be mixed with plasticizer and dispersed in a pebble mill, or, in some cases, on a three-roller mill, and the resulting water dispersions exhibit unusual stability to mechanical agitation, freezing, electrolyte contamination and to changes upon aging. Any sediment forming can be redispersed readily, and even dried-out material can be reclaimed without undue trouble. Pigments, fillers and stabilizers can be incorporated as desired, and the dispersions can be handled on conventional types of coating equipment. Fusing temperatures in the order of 300-325 deg. F. give optimum properties, and even 250 deg. F. bakes are adequate for many applications.

Information on the properties, preparation and techniques for handling dispersions has been gathered by the laboratories of Bakelite Corp., and is available on request.

FOR SILK: Setocyanine Dye

Hilton-Davis Chemical Co., Langdon Farm Road, Cincinnati, Ohio, has just added Caribbean Blue, an extremely brilliant silk dye to its line of textile dyes. Hilton-Davis is one of the few producers of this color in the U.S.

Sometimes called scrocyanine and having the color index number of 663, this dye was first produced for export to Japan. It is now available generally in this country.

Protective Film for Cork

Armstrong Cork Co., Lancaster, Pa., has developed a new material which can be used as either an adhesive or finish for corkboard or cork covering to prevent damage to the insulation from solvent products.

The new product, called Solvopruf, is a self-curing compound which may be applied by brush or trowel. It sets to a rubber-like film at room temperature and remains in this condition when exposed to temperatures ranging from —35 deg. F. to 125 deg. F. Upon aging six or seven days, Solvopruf is resistant to the action of toluene, methyl ethyl ketone, gasoline, kerosene and water. Although benzene causes Solvopruf to swell, the protective film remains in a service-able condition.

Solvopruf is manufactured for shipment immediately prior to application. It is not to be stored. It is recommended for use only with corkboard or uncoated cork covering since the solvent in the material will soften asphalt products.

Solvopruf is mixed for application on the job. The mix will remain in a fluid condition at normal temperatures (Continued)

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den Purecepia ere neutral citure of paralystemy-nele acid—fine white powders peaceteing ex-sely high preservative powers for many materials leet to deterioration canced by meld, fungue, a or ineterial action— annafacturers of creams, lottons and powders taining fats, oils, guess, carbohydrates and sim-materials use Reyden Panusepts to safeguard lity and effectiveness of their products—and to

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Benzaldehyde - Benzoates - Benzoic Acid - Benzyl Chloride - Bromides - Chlorinated Aromatics enzenes - Creosotes - Formates - Formaldehyde - Formic Acid - Glycerophosphates cols - Hezamethylenetetramine - M.D.A. (Methylene Disalicylic Acid) - Paraformaldehyde Parahydroxybenzoates - Penicillin - Pentaerythritols - Salicylates - Salicylic Acid - Streptomycin



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Please send me technical information and samples on the following Parasepts:

Here's WHAT makes this KENNEDY VALVE Better and WHY!



BODY, branze, rugged construction, high reised seat, generous interior passages and ample pipe thread clearances.

RENEWABLE COMPOSITION DISC, provides per-

fact seating; asbestas for steam service and spe-

cial types for various services and temperatures.

BEVELED SHOULDER, makes tight joint with conical seat on underside of bonnet when valve is wide open, for repacking under pressure.

disassembly and reas-

Write for Bulletin No. 36 . BUY FROM YOUR LOCAL DISTRIBUTOR



Office-Warehouses in New York, Chicago, San Francisco . Sales Representatives in Principal Cities

New Products, cont. . .

for approximately two hours and must be used within this period.

The new compound has come through extensive testing successfully. Installations where it has proved satisfactory include oil refueries.

HIGH MELTING:

Oxamide

Arapahoe Chemicals, Inc., Boulder, Colo., announces the semi-commercial production of oxamide, (CONH₇)₈, a white crystalline powder of extremely high melting point. Since its melting point, 419 deg. C., is the highest known for a simple organic compound, oxamide should be of special interest in flame-proofing and wood-treating.

Oxamide also offers a stable, anhydrous derivative of oxalic acid for organic synthesis. It is believed that research will develop many commercial applications of this product. The company can now offer this unusual chemical for the first time at moderate cost for research and pilot studies. Arapahoe invites requests for free laboratory samples from potential users.

HIGHER POTENCY:

Vitamin E

Winthrop Stearns Inc., 170 Varick St., New York, N. Y., is now offering Tofaxin, its braud of Tocopherol (Vitamin E) in capsules of higher potency to meet demands of physicians for high oral dosages. It is being marketed as Tofaxin Stronger.

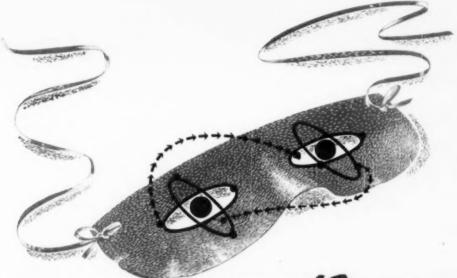
This more potent Vitamin E contains mixed tocopheryl acetates equivalent by biologic assay to 100 mg. DL-alpha tocopherol. The regular Winthrop-Stearns' Tofaxin capsules with the equivalent of 30 mg. DL-alpha tocopherol are being continued.

Tofaxin is especially suited for oral administration, since it contains the acetate esters of mixed natural tocopherols. In the intestinal tract, the pancreatic and intestinal ferments hydrolyze the esters with the liberation of free tocopherol.

Capsules of Tofaxin Stronger, the new more potent Vitamin E, are available in packages of 100 and 500.

Lipids

Armour & Co., Union Stock Yards, Chicago 9, Ill., has developed a new product, BSC Lipids, of interest to researchers. As its name indicates, BSC Lipids is an extract of beef spinal cord after the removal of cholesterol, and it contains spingomyclins, other phosphatides and cerebrosides. BSC Lipids (Continued)



NOW...FAIR EXCHANGE S ROBBERY!

YES, ION EXCHANGE HELPS YOU ROB VALUABLES FROM WASTES AND ION EXCHANGE MAY SOLVE YOUR DISPOSAL PROBLEMS PROFITABLY!

See these new uses for ION EXCHANGE in the recovery of wastes:

- © REMOVAL of undesirable impurities from solutions now wasted
- O CONCENTRATION of valuable substances from solutions now wasted
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Permutit* has been headquarters for new ion exchange materials and applications for more than 35 years. Here are some of the problems Permutit ion exchangers and equipment deal with successfully:

METAL RECOVERY:

Copper, gold, platinum, paladium, chromium, molybdenum, vanadium, and iron recovery by several ion exchange processes. In some cases recoveries as high as 97% are realized!

ORGANIC COMPOUND RECOVERY: Nicotine recovery from the exhaust gases of cigarette tobacco dryers by cation exchangers. Tartrate recovery from winery wastes by anion exchangers. High grade pectin manufacture from waste grapefruit peel. Sugar recovery from waste citrus peel press juice by removing the impurities by the Permutit Demineralizing Process.

These are only a few of the new developments in ion exchange. Permutit is sole manufacturer of all types of ion exchangers and ion exchange equipment. Maybe Permutit ion exchangers can help you! For further details, write to The Permutit Company, Dept. CE-7, 330 West 42nd Street, New York 18, New York or to the Permutit Company of Canada, Ltd., Montreal.

*Trademark Reg. U. S. Pat. Off.

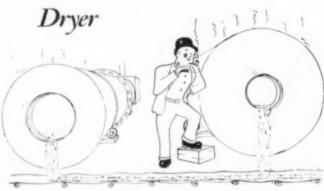
WATER-CONDITIONING

ION EXCHANGERS

MATERIALS AND EQUIPMENT



and the Derelict



"I'm not much on liggers—but we had these two rot'ry dryers in the plant, a RUGGLES-COLES and another, and it just seemed like we wusn't gittin' the work out o' the one of thim.

"I told the big boss about it, an' he sent one o' his ingineers over to run tests. Well, you should seen the look on this guy's face whin 'is figgers showed that we was burnin' a lot less coal per ton o' product in the RUGGLES-COLES."

Thim ingineers are on my side now. Whinever we add a new dryer to the set-up, they specify RUGGLES-COLES."

> *Based upon actual coal consumption tests of g RUGGLES-COLES "XA" double-shell dryer against another dryer in the same plant, drying the same material. Over a five-day run, the second dryer averaged 25% more coal per ton of dry material and the capacity of the RUGGLES COLES, per cubic foot of shell volume, was 1.8 times that of the second dryer.

> Give us pertinent details of your drying problem; write for Mardinge Bulletin 16-D-11.



YORK, PENNSYLVANIA - 240 Arch St. Main Office and Works NEW YORK 17-122 E. 42nd St. . 205 W. Wacker Drive-CHICAGO & SAN FRANCISCO 11-24 California St. 200 Bay St.-TORONTO 1



New Products, cont. . .

is a vellow, waxy solid with a melting point below 100 deg. C. It contains 2.3 percent nitrogen, 2.3 percent phosphorus, about 0.1 percent cholesterol, less than 2.9 percent choline and less than 2.3 percent reducing sugar.

BSC Lipids has been suggested as a superior emulsifier with special properties, as an inhibitor of thromboplastin, as a desirable anticoagulant, and for other uses.

Pilot-plant quantities of BSC Lipids are available for experimental use. The present price is \$1.75 per lb., net f.o.b. Chicago.

DEST-PURPOSES

Hydraulie Oil

For use in hydraulically operated machine tools that pressure-feed a way lubricant from the hydraulic system. Sun Oil Co. has introduced a new dual-purpose oil. Called Lubeway, the new lubricant has already been subjected to more than a year's exhaustive testing in machine tool builder's laboratories and under regular production conditions in industry.

It had been found that ordinary hydraulic oils did not perform properly as way lubricants because they did not possess adequate film strength or metal-wetting qualities. This deficiency caused chattering of the table, excessive wear on the ways, and made close tolerance and fine finishes impossible.

Called in by a machine tool manufacturer to tackle this problem, Sun engineers found the answer after extensive experiments by blending some of the ingredients used in the manufacture of Sunoco Way Lubricant with Sun hydraulic oils which have been "job proved" for more than 25 years in industry.

Tests in Sun laboratories and by machine tool builders disclose that Lubeway possesses all of the stability and the non-sludging characteristics of a good hydraulic oil, and it also possesses the metal-wetting and extreme-pressure qualities of a good way lubricant.

Throughout the experimental and industrial production tests, Lubeway was carefully checked to determine if this new product would impair the action of the pumps or other parts of hydraulic systems. All reports show that Lubeway gave completely satisfactory service and did not form any gummy deposits in the pumps, lines, valves or controls. It further proved its ability to protect ways and slides and assure their smooth operation.

Available in two viscosities. Lube way 150 and Lubeway 300 are recommended for hydranlically operated ma

heats economically

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PIPE LINE

HEATING

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& Steam Jet Heaters . . .

Mix steam with cold liquids . . . For uniform heating . . . Without noise.

They have no rotating parts . . .

To get out of order . . . Adjust or repair.

There are two basic types of & Heaters . . .

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Both operate efficiently . . .

To heat, agitate ... And circulate liquids . . . Economically . . . Without trouble.

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JET APPARATUS - NEAT TRANSFER EQUIPMENT - STRAINERS - CONDENSERS AND VACUUM PUBIPS - DIL BURNIME EQUIPMENT - POTAMETERS AND FLOW INDICATORS RABIAFIN TUBES - VALVES - SPRAY NOZZLES AND ATOMIZERS - GEAR PUMPS Tighten Up

WATER COSTS





Install a Deming Turbine

In your search for lower costs, don't overlook the possibility that your company may have an excellent underground source of water which could be made available for general water supply at law cost. In many instances, the combined costs of drilling the well and installing a Deming Deep Well Turbin Pump have proved to be LESS THAN THE COST OF "CITY WATER" FOR ONE YEAR! As Deming Turbine Pumps are built to last for many years, you can see why more and more plants are reducing their water costs by the simple method of owning their own water supply. For more details, you may wish to save time by filling in the form below and mailing to us.

	same
2	company
A W	rising
and A	Tellino .
	BREMINE

PUMPS AND WATER SYSTEMS

NEW PRODUCTS, cont. . .

chine tools that pressure-feed a way Inbricant from their hydraulic systems. Included among such tools are milling machines, grinders and boring machines

PAIN KILLER: Heptalgin

Heptalgin, a new pain killer six times more effective than morphine, has been produced by chemists in the Glaxo Research Laboratories of Greenford, Middlesex, England. Known in the laboratories as C.B.11, Heptalgin is the result of three years of research. Although from its trials the new drug appears to be as safe as aspirin, it will be given only on the prescription of a doctor until the medical profession has had every opportunity of testing its harmlessness.

Unlike morphine, it does not produce drug addiction, and it attacks the seat of pain without producing drowsiness or a feeling of depression. It can be swallowed as tablets or be given as an injection.

First clues to the new drug came from Germany when, in 1945, scientific search parties discovered that during the war the German chemists had evolved a useful new drug called amidone, an improvement on existing morphine substitutes. The Greenford chemists took this German drug to pieces to see what makes it tick. As a result, they produced a whole series of alternatives.

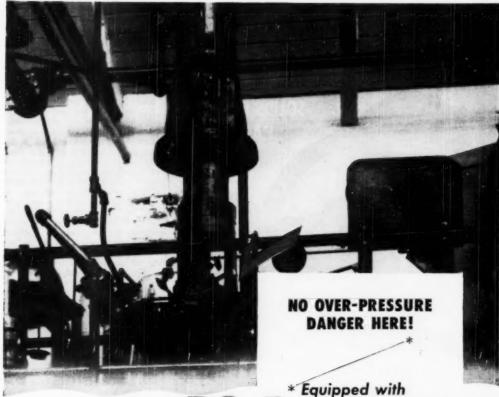
One of the series, C.B.6, was more powerful and less harmful than the German drug. But when the Green-ford chemists hit upon C.B.11, they were satisfied that they had got something with lower toxicity and greater analgesic effect than anything existing.

The drug can act within a few moments and rarely takes more than half an hour. Its pain-relieving effects last from at least three to four hours. In extensive trials carried out so far on patients, the drug has given quick relief in rheumatic complaints, pleurisy, heart trouble, sinusitis, toothache, gastric ulcers and inoperable cancers. Heptalgin is now generally available through the medical profession for public use.

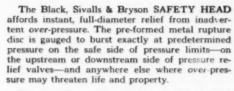
MACHINABLE:

Ductile Cast Iron

International Nickel Co., 67 Wall St., New York, N. Y., has developed in the research laboratories of its Development & Research Division a new engineering material described as ductile cast rom. It combines the process (Continued)



BS&B Safety Heads



For example, on the autoclave pictured above, the BS&B SAFETY HEAD (indicated by red check) protects against a "bursting point" which, if unknowingly reached, might wreck the surrounding plant and even destroy life. No further protection is necessary. No pressure vessel saleguarded by a BS&B SAFETY HEAD has ever blown up!

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New Type R Slurry Pump

Takes its suction from drive side only!

If the newest Morris Type R Slurry Pump had no other feature but this one . . . it still would be the most outstanding pump on the market.

Since the packing is under suction or positive head pressures only, it is not subject to the high stuffing box pressures typical of conventional pumps. Therefore, it is not vulnerable to severe wear and tear of abrasive solids. Packing troubles are at an absolute minimum. But this is just one of many Morris features which mean . . .

Longer Service With Less Trouble

- Easily dismantled Impeller and shaft sleeve can be renewed without disturbing suction and discharge piping or bearings.
- Simple in design The Morris Slurry Pump has no internal studs and bolts..., no traublesame joints and fits.
- Interchangeable shelf—Suction and discharge nazzle can be swiveled to almost any position. Shell changed for either right or left hand rotation.
- Other features The shell is not subject to high stress. Power requirements are surprisingly low. Operates equally well under vacuum or positive head. Con be used as a booster pump.

Easy to install! Easy to dismontle! Easy to mointain!

The Marris Type R is specifically engineered to handle mixtures containing are cancentrales: . . . tailings, slag, and residue from filters and classifiers. Operates an all types of caustic or acid mixtures containing absause as solids.

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MORRIS Centrifugal Pumps

advantages of gray cast iron, such as fluidity, castability and machinability, with the product advantages of cast steel. Its excellent physical properties, particularly high elastic modulus, high yield strength and ductility, suggest its suitability for many applications previously beyond the scope of cast iron.

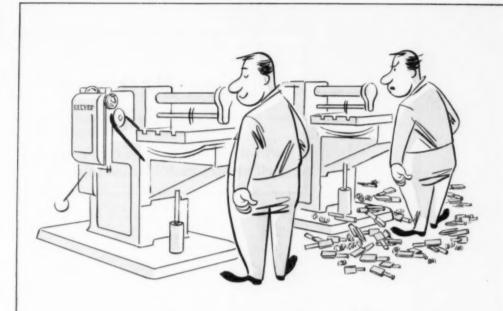
Production of this iron can be applied to common east iron compositions melted in the cupola or in other kinds of furnaces, and is based on the introduction into the iron of a small but effective amount of magnesium or a magnesium-containing addition agent, such as nickel-magnesium alloy.

This new material will take its place along with malleable iron, gray iron and cast steel in meeting the needs of industry. It will be advantageous to over-all foundry practices, as the new techniques should increase the importance of the foundry industry among metal-producing industries.

For pearlitic grades of cupolamelted material containing 3.2 to 3.6 percent carbon and 1.8 to 2.8 percent silicon, the duetile iron provides, in the as-cast condition, a combination of 85/105,000 psi. tensile strength, with some duetility. In contrast to gray cast iron, strength is only moderately affected by section thickness. Under stress it behaves elastically like cast steel rather than cast iron, having a proportionality of strain to stress up to high loads, with a modulus of elasticity of 25 million psi.

Potential applications for this new ductile east iron are obviously many and varied. The automotive, agricultural implement and railroad industries could apply it, both as-cast and heat-treated, in many component parts. Machinery in general, including machine tools, crankshafts, pumps, compressors, valves and heavy industrial equipment, such as rolls and rolling mill housings, could readily utilize its high strength and rigidity. Its ductility may provide thermal shock resistance far greater than has been available in high carbon castings heretofore. The superior resistance to growth and oxidation gives promise of its use in many engine, furnace and other parts used at elevated temperatures. Other products include pipe, textile machinery, electrical machinery, paper machinery and marine equipment. Service data will gradually accumulate to determine the improved quality, weight reduction and economy available in specific applications.

A number of foundries have already arranged licenses for the manufacture of the new cast iron under the pending patent applications of the International Nickel Co., Inc. —End



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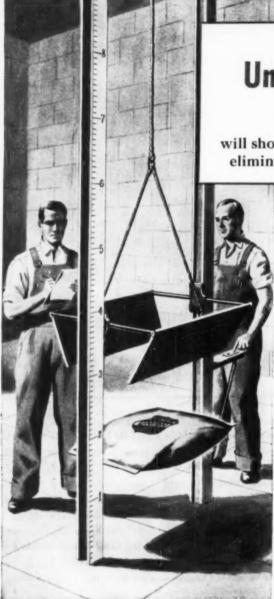
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Handling, Packaging and Shipping

R. W. LAHEY, Editorial Consultant

Highlights of the American Management Association's Packaging Exhibition and Conference

To those who have had the privilege of attending the American Management Association's Packaging Conferences since their inception, the marked improvement of the substance and methods of handling the conferences is apparent. Whereas in the carly conferences the agendas were top heavy with matters concerning artistic design and sales appeal, the program of the 1949 conference was well balanced. The discussions covered problems of container procurement, packaging for the retailer, technical papers referring to infestation prevention, polyethylene as a packaging material, and plastic bonding techniques, materials handling, shipping containers, and packaging machinery.

Noteworthy progress was also evident in the exhibitions. Displays included packaging machines, protective packaging materials and shipping containers in addition to items cov-

ering customer appeal.

The size and importance of the packaging industry was not generally recognized until it proved itself so important during the war years. The lessons learned during these critical times at such great cost taught industry the necessity of scientifically designing containers if effective product protection was to be achieved. J. D. Malcolmson, AMA vice president in charge of packaging, has estimated the annual sales volume of this industry at \$6 billion. Charles E. Lewis, in his talk on the economic outlook for packaging suppliers and users, stated that 8 percent of the steel ingot, 15 percent of the lumber, and 44 percent of the paper and paper board production was used in containers and packaging materials in 1948. The large attendance at the exhibition and the conference is further proof of the importance that industry places on packaging. It is interesting to note that the activity of the packaging industry is now considered to be a barometer of industrial activity.

Several speakers stressed the necessity of increasing production rates to help offset higher labor costs. Use of packaging machinery, properly designed containers and efficient materials handling methods, it was emphasized, can assist greatly.

It was forecast that the supply of all types of containers, closures and packaging materials should be adequate in the coming year. Polyethylene may prove to be the exception

if the demand increases.

T. P. Callahan, of Monsanto Chemical Co., discussing chemical containers, said that the use of multiwall paper shipping sacks had increased tremendously in the last few years. Not only are they the most economical bulk containers for packing dry products but increased protection has been accomplished through the use of heavier constructions and by the application of plastic coatings such as polyethylene to kraft. Fiber drums, he said, are ideal containers for dry chemical products and are readily accepted by customers because they are reusable with practically no cost for reconditioning. They can be fabricated to hold loads of 400 lb., can be palletized and provide complete freedom from contamination through the use of protective linings or plies incorporating a wide variety of materials including paraffin, amorphous wax, asphalt, glassine, plastics, and even foils. The 18-gage, 55-gal. steel drum is the most popular and economical package for liquids, according to Callahan. Continual improvement in this package has been possible through the combined efforts of the Steel Shipping Container Institute and the Metal Packages Committee of the MCA.

The application of performance standards to shipping containers has recently been studied by many packaging engineers as well as the Bureau of Explosives. In fact, there is a specification of this type for fiber drums in the ICC Regulations for Dangerous Articles. E. S. Petze, Scott Paper Co., emphasized the growing importance of this type of measurement evaluation for shipping containers. For example, the glass industry has adopted the drop test while the Porcelain Enamel Institute has recommended the Conbur incline impact tester and the LAB vibrator as the most significant criterion. There is a well defined trend towards the replacing of detailed construction specifications

with performance standards.

A clinic entitled "The Retailer Looks at Packaging" and conducted by a group of specialists, disclosed some interesting facts about shelf packages. In the food field the most significant trend has been the de-

(Continued)



FERTILIZER FOR THE ORIENT

Trailers loaded with bagged ammonium sulphate fertilizer on pallets from the Port Adams plant of Phillips Chemical Co. The loaded pallets are lifted aboard ship and unloaded in the hold. Empty pallets are returned to the plant.





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velopment of packages for distribution through self-service stores. In the discussion on drug packages it was emphasized that containers having reuse value or of special design to facilitate the use of the product create customer interest. The polyethylene spray bottle was cited as an excellent example of this. The manufacturer should reduce the units packed in a shipping carton in order to minimize handling and wrapping cost to distributors and retailers. Wholesalers can handle case lots for 6 percent, whereas shipping merchandise in broken lots increases their cost to 15 percent.

In a discussion on the development of automatic packaging machinery, George Woodruff recommended the use of standard machines if possible.

By far the most popular meeting was Charles E. Southwick, Jr.'s, technical discussion on the packaging applications of polyethylene. This resin, a polymer of ethylene, has proved to be a most promising packaging ma-terial and offers possibilities of reducing costs. It is similar in chemical structure to paraffin wax but has a longer molecule. It can be formulated in molecular weights ranging from 1,000 to 40,000. The melting point, tensile strength, insolubility and hardness increases as the molecular weight is increased. Polyethylene of 20,000 molecular weight, has a specific gravity of 0.92, tensile of 2,000 psi., clongation of 500 percent and tear resistance of 500 psi. It has excellent packaging properties. It is insoluble at room temperatures, is chemically inert, has varying grease resistance, does not change on aging indoors or out, is tasteless and odorless, is not toxic or volatile. Some solvents and petroleums are solvents for polyethylene. The resin is most easily formed or shaped with heat alone, by means of injection molding, extrusion, and is coated to paper and textiles by a fused resin technique.

According to Mr. Southwick, production of the resin in 1949 is estimated at 50,000,000 lb. which should provide for packaging requirements unless demand increases more rapidly than expected.

A wide variety of containers, packaging machinery, packaging materials, and accessories was on display at the exhibition. Although the glamour or customer appeal type of exhibits was well represented there were a substantial number of displays directed at the scientific phase of the problem. Plastics of many types and applications were shown at several booths. Polyethylene was spotlighted.

In the field of machinery, the Schroeder case sealer displayed for the first time incorporates a revolutionary change in equipment of this type. With an over-all length of not over 9 ft., this machine operates pneumatically, using compressed air at about 40 lb. One model automatically feeds and opens the case from a magazine. It is automatically lubricated. Glue is handled in a closed system and is applied by means of hydraulic pressure.

There was a wealth of information available at the conferences and exhibition on most phases of packaging that could not have been proved worthwhile for those who attended.

New Washington Law on Explosives Transportation

A bill, passed by the Legislature of the State of Washington and signed by the Governor, directs the Washington State Patrol through its chief, to take responsibility for safety in the transportation of explosives and other dangerous articles. The bill delegates to the patrol, power to make rules and regulations to protect persons and property from unreasonable risk of harm or damage. The chief is charged with the responsibility for making recommendations to the legislature and state departments which will bring about uniformity of federal regulations and those of the State of Washington.

The chief of the patrol is empowered to appoint a committee of five citizens of the state to serve in a purely technical advisory capacity. One member shall be from the explosives, one from the petroleum, one from the chemical, and one from the trucking industry. The fifth member is to be appointed by the Washington State Association of Fire Chiefs. Brien L. Shera of the Pennsylvania Salt Manufacturing Co., Tacoma, has been appointed to represent the chemical industry.

ASTM Subcommittees Report Progress

Following regular custom, ASTM Committee D-10 held its spring meeting early in May at Atlantic City in conjunction with the AMA Packaging Conference and Exhibition. This committee, headed by T. A. Carlson, Forest Products Laboratory, has produced four standard and seven tentative standard container tests. As much of this work is pioneering in character it is often a long and technis job to prepare a standard test procedure.

A test to determine the water vapor permeability of shipping containers and tests to determine protection afforded by large crates and cases holding over 1,000 lb, will probably be approved in the near future.

Great interest was shown in the work of the subcommittee on performance standards. J. H. Toulouse of Owens Illinois Glass Co., chairman, reported that considerable needed data have been gathered but much further work is required before any performance standards can be recommended.

Other subcommittees are preparing definitions of packaging terms, studying the correlation of tests and test results and surveying the field of in-

terior packing.

ICC Regulations To Be Revised

A general revision of the ICC Regulations for the Transportation of Explosives and Other Dangerons Articles is planned by the Bureau of Explosives. Work on this revision will probably start in the next few months. It is probable that most of the war-emergency amendments, numbering several hundred, will be cancelled. Revocation of the emergency authorization to reuse single trip metal drums will come up for consideration. As supplies of steel sheets are adequate to meet the demand for steel containers, there is now no need to contime permission for reuse of these packages.

More Revised ICC Regulations

On April 14 the ICC published amendments to their regulations which became mandatory on July 14. Those changes of significant interest are

summarized as follows:

1. Sec. 163 c(note) Chlorate of Soda, Chlorate of Potash and Other Chlorates. The Spec. 37E and 37F metal drums authorized for export shipments for packing maximum gross weight of 160 lb. must be fabricated from not less than 24 ga, steel throughout

 Sec. 265(a)(4) Hydrofluosilicic Acid. Spec. 10A tight barrels may now be lined with other materials than asphaltum provided these compounds are of equal efficiency and are resistant

to this acid.

Sec. 276(d) Anhydrous Hydrazine and Hydrazine Solution. Specs.
 and 5G stainless steel drums have been added to the approved list of containers. Metal must be Types 304 or 347 stainless steel.

4. Sec. 277(9) Hypochlorite Solutions Containing More Than 7% Available Chlorine by Weight. Tank (Continued)



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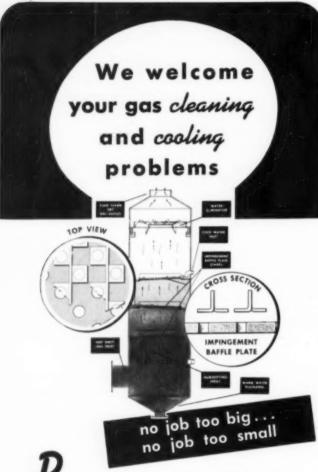
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PACKAGING, cont. . . .

motor vehicles used for transporting hypochlorite solutions are exempt from the regulations.

from the regulations.
5. Sec. 303 Compressed Gases.
Changes have been made in the following sections: Sec. 303(i)(2), (j)(3), (j)(4), (j)(5), (p)(b)(7).
6. Spec. 17E, 9(b) Drum Closures

6. Spec. 17E, 9(b) Drum Closures for containers of 12 gal, capacity or less may be of other than metal or of metal thinner than the metal in the walls and heads of the drums when openings are of not over 2.3 in, diameter. Such closures must be fitted with outside scaling devices which cannot be removed without destroying the seals. The Bureau of Explosives must approve any type other than metal. The new polyethylene spout will be authorized by this anendment.
7. Spec. 23F—13. The Solid Fiber

 Spec. 23F—13. The Solid Fiber Dynamite Box. May be fabricated with hand holes when approved by the Bureau of Explosives.

8. Specifications for Compressed Gas Cylinders have been amended as follows: Spec. 3A—13 (b); Spec. 3AA— 5 Note 1; Spec. 4BA—19 Note 1; Spec. 8-22(a) Note 1.

9. Spec. 12B. Pars. 11 & 16 Fiber Boxes. A new type of joint is permitted for cornigated fiber boxes only. This is a butt joint held by gummed kraft sulphate tape at least 2 in. wide on both faces. Different weights of paper are required on inside and outside of joints; also, the weights of tape vary with the gross weight of the container.

10. Spec, 17X Par. 2 Steel Drums. Drums of over 30 gal, capacity may now be fabricated to a maximum size of rated capacity plus 2 percent plus 1 gal. The maximum capacity has thus been increased by 3 qt.

The order should be consulted for the complete details.

Correction

We reported last month (Chemical Engineering, June 1949, pp. 1924) on MCA committee meetings. There was an error in the last sentence and the item was incomplete. The sentence should have read as follows: After exhaustive plant tests, several hundred 55-gal. drums have been shipped to foreign destinations. The paragraph should have continued: It was reported that all of these containers were received in good condition. It is probable that application will soon be filed to amend water and rail regulations to authorize use of these venting bungs.

The remainder of the MCA committee story we should have printed follows:

(Continued)

298-4

Layers and Lumps make Heating expensive!

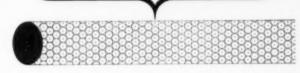
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AIR GAS
AIR GAS

SOME HAVE IT THAT WAY....



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PREMINE, cont. ..

An investigation of the cause of fires on shipboard caused by sodium hydrosulphite have been attributed to the use of the conventional type full open head steel drams. Water and water vapor have been able to reach the product due to inherent weaknesses of the open head construction. A joint investigation by the committee and the Bureau of Explosives led to the adoption of an improved open head steel drum the use of which is required for water transportation, This drum is covered by ICC Spec.

Tests have been arranged for containers fabricated of a magnesium alloy for packing 30-60 percent hydrofluoric acid. Both strength and corrosion tests will be conducted.

An entirely new type open head steel drum has been under test for over a year. This construction consists of pressed lugs on the cover and interrupted grooves on the side wall of the drum, thus climinating the standard ring ordinarily used for holding the cover in place. Further tests were arranged to obtain a more complete evaluation of this construction with the conventional type. It was reported that this cover could be removed without using the tool that has been devised for locking the cover in place.

The committee agreed to recommend to the ICC adoption of the Spec. 5K nickel drum for transporting benzoyl, thionyl and acetyl chlorides.

Investigation of adhesives for and methods of application of labels to steel containers is progressing. Tests are now under way with adhesives of the plastic type which are activated by heat.

The Tagliabue closed cup method of determining flish point of liquids required by the regulations has been the subject of investigation. Although the work has not been finished, sufficient data have been obtained to indicate that there will probably be some revisions in present standards recommended.

Harold Bergstrom, in charge of development for the paper container division of Continental Can Co., discussed recent improvements in fiber drum constructions. Of particular interest was a new Geon latex coating for exteriors of these drums which was reported to be extremely water resistant. It was also stated that a sheet consisting of aluminum foil laminated on both sides to 60-lb. kraft with asphalt is the more resistant to transfer of water vapor than any other film available for this purpose.

The next meeting of the committees will be held in October.

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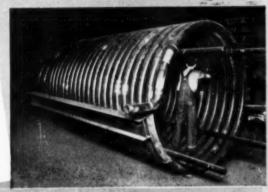
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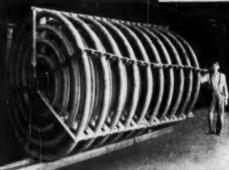


A nest of box colls containing 850 ft of 2" extra strong seamless pipe, to be used as storage tank beater.

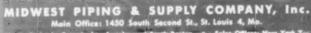
Catalytic reactor call consisting of 20 flat spirals of 4½" OD x ¼" wall 4-6% chrome, ½% mely seamless pipe. Full-furnece annealing distorted temporary shipping straps.



Nested hairpin call used as unit heater in 14" diem tunk; made from 300 ft of ¾" OD x #14 BWG secraless boiler tubing.



Condenser cail fabricated from 2" OD x ¾" wall seamless steel pipe. Coil was tested to 7500 psi and is 26 ft long.



Plants: 31. Louis, Pessoic, Les Angeles and South Boston + Soles Offices: New York 7— 30 Church St. + Chicago 2 — 79 W. Monroe St. + Les Angeles 33 — \$20 Anderson St. Houston 2 — 229 Shall Bidg. + Tulse 3 — 533 Mayo Bidg. + South Boston 27 — 426 First St.



4 PLANTS ARE BETTER THAN I



An ordinary sulphur burner, which burns solid sulphur on a tray or rotating cylindrical surface, cannot provide a definite, constant burning rate. Since ordinary sulphur contains a small percentage of organic matter, this matter accumulates as a carbonaceous scom on the surface of the burning sulphur, and gradually extinguishes the fare. In order to overcome this factor the Acme Sulphur Burner is operated at a controlled rate sufficient to bars of this scom. Also, in an ordinary burner, the addition of a fresh charge of sulphur to the burning surface disrupts the burning rate for several bours. The Acme Sulphur burner has a special feeding device that feeds melted sulphur to the burner has a special feeding device that feeds melted sulphur to the burner is a manore that does not disturb the burning surface, at the same time maintaining a constant level of burning sulphur. Thus, uniform production, complete combustion, and continuous operation result.

The Acme Salphur Buroer will operate equally well under pressure or vacuum, and the manufactured gas can be discharged directly so the absorbing apparatus. Efficience operation results either for single burnur of better operation. Where required for large scale production, automatic operating controls can be foreigned.









LONE COPPERSMITHING & MACHINE CO., DRITAND, PA., IL S.

-OPERATING PROCEDURE-

Solid sulphur is charged into the hopper of the melting chamber, around which live steam is introduced at about 25 pounds gauge pressure (if steam is not available, an electric heating element is supplied). The melted sulphur is fed to the consession chamber by means of the fooder, which automitically maintains the correct level. Comprehed also, or air furnished by a blower, is used for combestion. The quantity of air supplied regulains the concentration. The quantity of air supplied regulains the concentration. The quantity of air supplied regulains the concentration. This together with the anotherising level of molten burning surface, and a construint of mapple, guarantee a constant hurning rate and thereby a uniform production of \$02.

Men, Machines and Methods

ROGER WILLIAMS, JR., Assistant Editor

Since many of our readers do not work for large companies with regular public relations staffs, we are passing on to them this month the contents of a brochure written by the Koppers public relations staff. The booklet is designed for plant managers and other company officials "who may, from time to time, be in touch with the press or radio."

Dealing with the press may occur seldom to the technical man. But when it does, that technical man must maintain good relations with the press and radio people involved. As Ralph Winslow, Koppers' Director of Public Relations puts it, "The press and radio are vital mediums through which the public is influenced to look with favor or disfavor upon our company. For this reason it is imperative that we maintain good relations with these mediums, that we understand what they require from us, and what we may expect from them."

The job that Winslow and his associates has done is so good, we feel, that all plant management men should read

it. Here it is, verbatim.

Things to Remember About Press Relations

 Good community relations are essential to the welfare of our Company. Good relationships with the press and radio are necessary to good community relations. To maintain good press relations, questions of the press must be answered with forthrightness and dispatch.

2. Evasion or side-stepping of the questions put by newspapermen tends only to create the belief that we have something we wish to hide.

something we wish to hide.

3. It is bad policy to argue with professional newspapermen about the value of a news event. They have learned by hard experience to evalu-

ate it at its true worth,

4. Bad news inevitably becomes
known to the press. It is best that it
become known from Company
sources. In that way it escapes secondhand exaggeration.

A Company representative who gives one paper a "scoop" on its rival will find that he has lost effective contact for the future with the rival paper. On the other hand, a suggestion for a story or interview, madeby one paper, should be treated as an "exclusive" and given to that publication only.

6. Should a major tragedy visit a plant, establishment of a press headquarters at the plant and assignment of one man to full-time cooperation with the press is recommended for as long a period as the emergency shall last.

 Advice from newspaper-trained men in the Koppers Public Relations Section is as close as your telephone.
 It is available night or day.

8. Personal assistance in handling press relations, when necessary, is available from the Public Relations Section of your Company as quickly as available transportation can get it to your plant. A day later some friends will call.
"Nice writeup Koppers got in the Tribune," they will say, and we'll glow with pride, knowing that the 300,000 readers of the Tribune have had a chance to learn what a good company

Koppers is-something we knew all the time.

But, try as hard as we may to operate our business in such a manner that it draws only favorable public opinion, things sometimes happen that do not put us in a favorable light. It may be a strike, an accident, a lawsuit, a necessary price increase when the public wants lower prices, or an unavoidable reduction of working force. We'd be just as happy if the press forgot about this one. It's mostly our business, isn't it? Or is it?

Now, again the press is on the phone or at our door. And there are questions—lots of them. What will we tell the newspapermen? As little as possible? Or, perhaps, give them the old "no comment" treatment? Neither is recommended.

The newspaperman wants the facts only because he knows that a large segment of his newspaper's reading

public is interested. If the event that brought the newspapermen to our door is news, we may be sure the public will hear about it in one manner or another. The press will seek the best source of information first. If denied cooperation, it will then seek the next best source. It won't give up easily. If we who are in the best position to know what happens in our plants won't talk, there are others who will. Their stories may be garbled or prejudiced. Yet, since they comprise the best available information, they'll be quoted in the press in full, perhaps with this brief idded line:

(Continued)

How to Meet the Press

Sooner or later the newspaper and radio reporters will be ringing our phone or standing at our office door. They're going to ask a lot of questions. Perhaps they'll have photographers along and want to snap pictures. We realize that the information they get will be widely publicized.

That seems desirable—if the story they want is favorable to the Company and its people.

So, happily, we sit back and converse with them easily, answering all their questions, inviting the photogs to "shoot away," and suggesting that it would be nice to have prints of the photographs for our files.



They'll ask a lot of questions

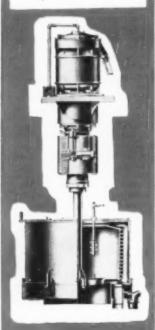
CENTRIFUGALS

If your centrifugal requirements preclude the use of "standard" machines, investigate the Roberts Fluid Drive Centrifugal. This machine can be built to do your job.

k

Only in the Roberts Fluid Drive Centrifugal are these features to be had-

- Standard motor, with current peak less than 40% of direct connected (special) motor drives
- Torque application uniform and adjustable.
- Simple adjustment for accurate speed control.



Let us show you how these exclusive features can be made to work for your benefit. Your inquiry in-

WESTERN STATES MACHINE COMPANY HAMILTON, OHIO, U. S. A. M M & M, conf. . .

"Company officials refused to give out any information."



Someone's always willing to talk

From such a printed statement readers of the press are quick to infer that the Company has something to hide. And yet, our Company spends huge sums of money to protect its workers, seeks constantly to obtain the goodwill of its employees and its customers, to make good products and sell them at a fair margin of profit, and to provide job stability.

WHAT THE PRESS EXPECTS

Let us see, then, what the press expects of us and what we may expect

from the press.

First of all, the press expects that we will give them reasonable cooperation. We believe in that. That's why our Public Relations Section. Central Staff, has press relations as one of its specific duties. Members of the section have had experience as working newspapermen and newspaper editors. As a result of this background, they have learned how to work with the press to obtain the best results.

Our Public Relations Section stands ready to be of service to any division, any plant, at any tane, in furnishing assistance and advice in press relationships. It is subject to call night and When the occasion warrants, it quickly sends a representative trained in press relations to any one of our 55 plants. It prepares information of interest to the public and mails it out to newspapers, magazines, and to radio editors. It finds the answers to queries made by the press, furnishes it with pictures, with statements from our officials, etc. Yes, we try our best to cooperate with the press.

Good press relations, Etc good public relations, however, remure alertness and understanding on the part of all our people. A central Public Relations and Press Relations staff can formulate plans and policies, can work on a national or local scale to obtain the favor of our public. But in emergencies, it is the prompt action and the attitude of Koppers people who live and work in an individual community that can best keep us in favor in that community.

The press expects us to be frank and open, to answer its questions as directly as possible, and to be willing to help them to get the answers that are not immediately available.

Actually, newspapermen are no more impatient than are we. If they seem so, it is because the commodity in which they deal—news—quickly loses its value with age. "There's nothing older than yesterday's newspaper" is a time-honored saying in the newspaper profession.

A well-known news gathering or ganization has this slogan: "Get it First: But First, Get it Right." All good newspapermen seek facts, not licarsay information. And they know that they must go to the best available sources of information to get the ficts. Only when denied facts from the best available sources do they seek out secondary sources of information. It is then that they are forced to accept statements which may be halftruths, that may be motivated by prejudice. In printing these they make no attempt to present them as absolute truths. They attribute them to the source, and it is left up to the reader to determine if that source is reliable or not.



PR assistance available quickly

But there they are in the public prints, and if the same story carries a notation that the Company refused information, it is only natural that the reader jump to the conclusion that the statements are correct and that the Company is trying to hide the facts.

Let's see how this whole thing works b: taking a hypothetical case.

Presume, for the sake of illustration, that a plant accident results in the death of one of our employees. Police and the coroner are notified and the newspapermen, who constantly check all these news sources, are on the scene almost immediately. They'll seek out the plant manager or other responsible official and ask for details.

NOTHING TO HIDE

We tell them frankly and fully what happened, so far as we know. If they want more information, we try to get it for them at once. We also tell them briefly what we do to prevent such accidents, tell them a full investigation of this one will follow, and let them know that we are genuinely concerned about the man's family. We don't hold back anything.



People believe their newspapers

We "shot square" with the newsmen. We told them all we could, didn't force them to hunt information elsewhere. The chances are that the stories they write in the paper or broadcast won't give us a black eye. One might read like this:

LABORER FATALLY HURT AT FACTORY

Blanktown, Ill., Oct. 1—John Smith, 48, a laborer at the local plant of Koppers Company, Inc., was instantly killed today when he toppied over a rading at the plant and fell 30 feet to a cement divieway.

Koppers officials said that they were at a loss to know what caused the accident, as an inspection showed that the railing was in good condition, and there was nothing involved in Smith's duties that would require him to climb upon the 4-foot-high red

South had been employed at the Koppers plant for 10 years, and had been known as a careful worker. It was the first fatal accident at the plant in six years.

Still considering the hypothetical case, here is the type of story that conceivably might be printed if we had refused all cooperation with the press:

PROBE NEGLIGENCE IN PLANT DEATH

Blanktown, Ill., Oct. 1—John Smith, 48, a laborer at the local plant of Koppers Company, Inc., was instantly killed today when he toppled through a railing at the plant and fell 30 feet to a cement driveway.

(Continued)



Believing that a good record of achievement is a true indication of ability, we are proud to show the extent of our accomplishments in designing and building Goslin-Birmingham Evaporators. The list of installations now in successful operation includes the following—

SIZES: 100 sq. ft. to over 60,000 sq. ft. heating surface.

TYPES: Long Tube Vertical Film, Long Tube Recirculating, Forced Circulation, Horizontal Tube, Falling Film, Short Tube Calandria.

MATERIALS OF CONSTRUCTION: Steel, Stainless, Nickel. Cast Iron, Copper and Copper Alloy, Lead.

USES: Sugar, Kraft and Soda Black Liquor, Citrus Press Water, Distillery Wastes, Alumina, Steepwater, Caustic, Salt, Sodium Sulfide, Steffens Filtrate, Pineapple Press Water, Glucose, Tank Water, Sulfite Waste Liquor, Sodium Sulfate.

If your problem involves evaporators, or other standard or special chemical process equipment, you can save yourself a lot of headaches by enlisting the aid of G-B's staff of experienced engineers, and by placing your order where sole responsibility for design, construction and final operating results is concentrated in one reliable organization.

Years of experience have developed within the G-B organization the "know how" for solving evaporator and other problems in the chemical process industries. And G-B's service program of periodic calls by capable and experienced engineers insures peak performance of the installed equipment.

> Your inquiry for details on any G-B equipment will receive prompt attention.

PARTIAL LIST OF G-B PRODUCTS

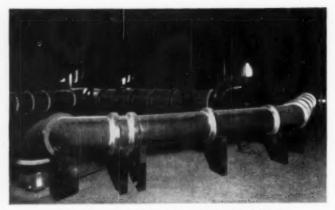
EVAPORATORS . FILTERS . FLAKERS . CAUSTIC POTS
CONDENSERS . LARGE SPECIAL CASTINGS

and many other items of standard and special chemical process equipment.

GOSLIN BIRMINGHAM MANUFACTURING CO., INC.

BIRMINGHAM I, ALABAMA

HEW YORK: Guille Birmingham, \$50 Medium Are. CHICAGO: F. M. deBoon and Associates, 20 H. Wacker



Knight-Ware Ventilating Pipe and Fittings in the Hall of Chemistry at West Virginia University.

KNIGHT-WARE Pipe and Fittings Offer Permanent Protection

KNIGHT-WARE, a tough, close grained ceramic, is not dependent on a surface glaze or coating for protection,—it is corrosion proof throughout its entire body. Because of its complete resistance to corrosion* it is widely used in permanent installations where positive, lasting protection is essential.

Many leading institutional and industrial laboratories, where all types of corrosives must be handled, are equipped throughout with Knight-Ware. Some of these installations have been in constant service for over 40 years without signs of corrosion.

Knight-Ware Standard Pipe and Fittings with flanged or bell and spigot connections are available in bore sizes from 1 to 60 inches. When standard sizes cannot be used special pipe and fittings can be made to specification at comparatively low cost.

Write for a Knight-Ware pipe bulletin, specifying in your letter type of situation and service involved.

* Only known exceptions: Hydrofluoric acid, hot caustics.



MAURICE A. KNIGHT 107 Kelly Ave., Akron 9, Ohio



M M & M, cont. . .

Koppers officials refused information on the accident. Coroner William Brown said that he had not yet had time to make a complete investigation, but that he planned to probe reports that the railing had been in need of repair for some time.

Yes, there probably would be more to that story—and none of it complimentary to the Company. Why? Because the newspaperman, thwarfed by the best source of information, would have to resort to printing rumors. Rumors are never as accurate as facts. But what could the newspaperman do? He wouldn't have lasted long in his job had he handed the city editor a story which said:

"John Smith, 48, was killed in a fall at the plant of Koppers Company, Inc., today. Company officials refused information, and it is probable that no details will be known until the coroner's jury meets next Tuesday."

It even sounds rather ridiculous to us when put in that light, doesn't it?



"Get some facts in that story"

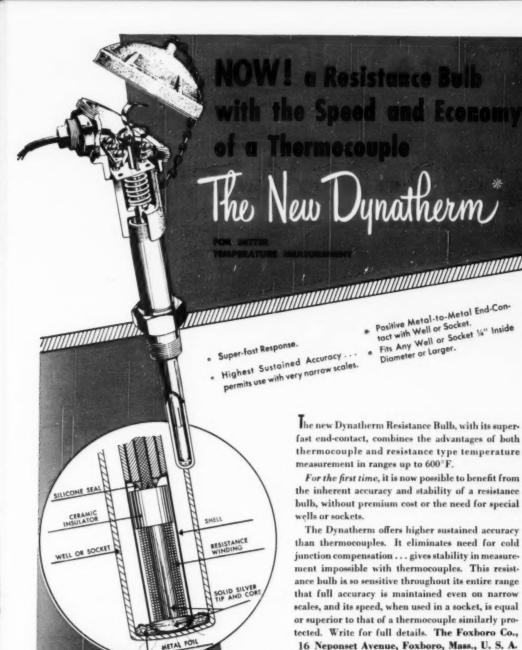
Now continuing our hypothetical case, suppose the railing actually had broken. We could "clam" up about the whole matter, and the story in the papers might be substantially as the "probe negligence" version above. Or, we could admit very frankly that the railing was found to be broken and tell when it was last inspected. Then the story might read thus:

WORKER IS KILLED AS RAILING BREAKS

Blanktown, Ill., Oct. 1 – John Smith, 48, a laborer at the local plant of Koppers Company, Inc., was instantly killed today when a railing protecting a ramp used by electric lift-trucks gave way, allowing him to fall 30 feet to a cement driveway.

Koppers officials said that the railing had been inspected last week and found to be in good condition. They started an immediate investigation into the causes of the accident. One official said that it was possible that a passing lift-truck had struck

(Continued)



* Trade Mark

HOXBORO

INSTRUMENTATION



lifferent Problems...Same Answer!

FLAT-TOP DECKING - The smashing weight of landing planes gives a carrier flight deck continuous, heavy punishment. That's why the Navy went to work with plywood experts to find the ideal decking material. Experimental



deck installations on U.S.S. Bennington, pic tured here, using veneer facings over layers of untreated Redwood lumber, met every Navy specification. So the newest Navy carrier, the U.S.S. Oriskany, wears a flight deck of California Redwood laminate. The job called for fire resistance, light weight, strength, dimensional stability, and excellent gluing properties and Reduced was the answer!



ATOM PLANT COOLING TOWERS-The Oak Ridge atomic plant needed dependable watercooling towers - fire-resistant rowers that would inhibit decay and organic growth-that wouldn't warp even under intermittent wetting and drying. Here again, Reduced was the answer!



SUBURBAN RAILROAD STATION - No gloom or ugliness in the Pennsylvania Railroad's new commuter stations. Raymond Loewy designed the brick and Redwood structure above - a happy wedding of function and beauty. The job called for economy, durability and attractive appearance—and Reduced was the answer!

PRIZE-WINNING HOMES, TOO Five of six prize-winning homes at the recent American Institute of Architects convention were constructed of Redwood. Pictured is the first-prize



On your trip to California visit some of the Redwood Parks and National forests where over 72,000 acres of Redwoods have been permanently set aside for public use.

THE LUMBER THAT INDUSTRY CHOOSES FOR THE TOUGHEST JOBS.

Perhaps Reduced is the answer to YOUR problem, too. Why not the california Reduced Association there and see: Engineering data available on many not of Reduced, including

- ood, milading
 Contina Towers
 Sorane Tanks
 Treating Tanks
 Laminaged Uses
 Core Stock
 Wood Pipe
 Lined Metal Pipe
 Mill Roofs
 Window Sash and Frames
 Sew age Disposal Units
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M M & M, cont. . . .

the ramp railing, weakening it, and that the damage had not been reported as specified in Company rules.

Not exactly favorable, but not as unfavorable as might be. At least we have made it known that the Company has regular safety inspections; that we are anxious to investigate. We have shown deep concern. In other words, we have been human-not just a cold corporation. Certainly the story is more favorable than the one which might have resulted had we refused all information

MAJOR DISASTERS

Hypothetical cases? Yes. We all hope that such eases will not happen, but if we are realistic, we know that they sometimes do happen. When they do, forthrightness with the newspapermen will pay us big dividends. Lack of forthrightness will only open us to suspicion.

We also must consider that there is a possibility-remote as it may be -that a major disaster may visit one of our plants. In such cases a little different handling of the press is required, and it becomes vastly more important that our relations with the press are forthright and prompt. More newspapermen will be on the scene; they will be more anxious for details and they will be quicker to seek information from less-qualified sources, if they cannot obtain information from us speedily.



Supply facilities for the press

In such cases, an excellent procedure is to set aside a room at the plant as a press headquarters, and assign one Company man to the sole task of assisting the press. That man should follow the procedure described above in giving the press all information possible and in getting answers to questions which he cannot himself answer. If possible, the newspapermen and photographers should be taken to (Continued)

(Fift in other problems) ...



Special design features permit calendering a wide range of products...to exact gauge ... at best production speeds

This new Farrel-Birmingham Z-type calender has a built-in device which provides enger has a numerin device which provides means for crossing the axes of the two bottom rolls to compensate for roll deflection.

With this device, the amount of the opening created by crossing the roll axes (which is closely equivalent by crossing the roll axes (which is closely equivalent to roll crown) can be varied at will by simply pushto roll (rown) can be varied at will by simply pushing a burton. Thus the "crown" can quickly be changed to compensate for the differences in separatchanged to compensate for the differences in separating force caused by variations in stock composition, gauge and speed. A flat gauge is obtained across the entire width on a variety of stocks, under a wide entire width on a variety of stocks. range of calendering conditions.

In addition to this "crown" control feature, other inin addition to this crown control feature, other in-novations that contribute to this calender's unusual performance ability include:

- "Z" arrangement of rolls. No vertical pressure from a third roll affects roll settings. Exposure of material on any roll surface is limited to a
- 2. Positive roll positioning by hydraulic preloadrositive roll positioning by hydraulic presonding devices which anchor the rolls exactly as
- 3. Rolls chamber bored and drilled under the working surface for most effective temperature
- 4. Improved system of flood-lubrication for roll
- Drive and connecting gears enclosed in a housing separate from the calender.

Write for further information or engineering

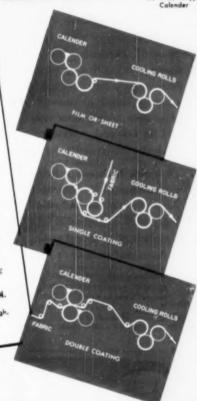
FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

PARKEL - BIRMINGHAM CUMPARY, INC., ANSUNIA, CURN.

Plants: Arsonia and Derby, Conn., Buffolo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Baston, Pirisburgh,

Akron, Chicaga, Los Angeles, Tulsa, Houston



8" x 16" Z-type Laboratory Colender

28" x 66" Z-type

Farrel Birmingham



A manufacturer requiring good limestone has only to look at Oklahoma - - and he will find what he needs. For limestones are widely distributed over the entire state.

In the Arbuckle Mountains, limestone deposits have a combined thickness of about 8,000 feet (if the dolomites are included). Physically, Oklahoma limestones range from friable or chalky to stone with maximum crushing strength; from coarsely crystalline to very fine-grained; and from minutely oolitic to coarsely pisolitic. Chemically, they

range from impure stone suitable for woolrock to chemical grade.

Oklahoma limestone is being utilized extensively for many purposes. Its quality and availability merit consideration for a multitude of additional uses.

Detailed information on Oklahoma's mineral resources is available on request, based on data by the Oklahoma Geological Survey. Map showing location of mineral deposits is also available.

CeO 54,760 MgO 0,680 SiO 0,141 Fe ₁ O 0,074 Al ₁ O 0,171 P ₁ O 0,000			1.00	B 21	ret)		-
MgO 0.680 SiO ₂ 0.141 Fe ₂ O ₃ 0.074 Al ₂ O ₃ 0.174 P ₂ O ₃ 0.001							Percent
\$10; 0.14 Fe; 0, 0.074 A1; 0; 0.174 P; 0, 0.001	C=O	6		0	0		54,760
Fe ₂ O ₃ 0.074 Al ₂ O ₃ 0.174 P ₂ O ₃ 0.007	OgM		0			0	0.680
A1, O1	SiO,					0	0.143
A1, O, 0.174 P, O, 0.007	Fe, O				0		0.074
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50, 0.000	50.	0				0	0.008





M M & M, cont. . .

the scene of the tragedy. Nothing will be gained by keeping them away from the scene, but they can be kept together and given expert guidance and assistance. They will thank the Company for this, and their stories will reflect the good feeling they have for the Company.

If the clement of danger surrounds the disaster scene, the press, naturally, cannot be allowed to go near it. In this case, the danger should be fully explained to them, and it should be made clear that only rescue workers are being allowed in the area. Then, also, the Company representative assigned to handle the press should go into the area himself to obtain names of the dead and probable causes of the disaster, and return at frequent intervals, reporting such news to the press.

Adequate felephone facilities should be placed at the disposal of the press. No member of the press should be barred by Company guards, but all should be escorted to the press room where the Company representative can satisfy their demands with alacrity and impartiality.

If an occasional event that creates news is, on the surface, unfavorable to the Company, certainly Koppers has an abundance of newsworthy activities that can place us in a favorable light. A report on some of these activities often fits into a reporter's story that might be considered unfavorable—and can help to take the sting from it.

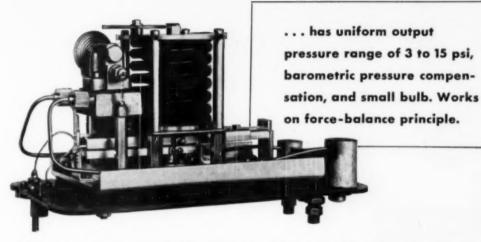


Equipment is inspected regularly

Let's list some of the favorable factors we should bring to the attention of newspapermen when they are working on a story with damaging aspects:

In Accidents—We spend much money to carry out our safety programs. Why not let the reporters know about our safety and inspection programs and the organization which directs it? Let them know of the concern of the Company for families of (Continued) New Taylor Temperature Transmitter with SPEED-ACT

TRANSAIRE*



AT a meeting in Texas the other day, oil men praised this new Taylor Transaire forcebalance temperature transmitter for three features above all others:

- 1. Standard output pressure range of 3 to 15 psi cuts maintenance, making special calibration of receivers unnecessary.
- 2. Barometric, temperature compensation, exclusive with Taylor, is vitally important where close temperature measurement and control are critical.
- 3. Cigarette-size bulb speeds up response; can be installed in limited space.

IN ADDITION, SPEED-ACT, employing for the first time derivative response to the measuring system, may be added to compensate for thermal lags where separable wells are required.

OTHER IMPORTANT ADVANTAGES FOLLOW:

Faster—63% response in less than 2 seconds. Up-to-1000-feet pneumatic transmission of temperature with extreme accuracy.

Little or no maintenance needed, thanks to force-balance principle which practically eliminates wear.

Short, shiftable range spans with a simple screwdriver adjustment.

Great overrange protection. Overall temperature limits from minus 375° to 1000°F.—with overrange protection to 1000°F.

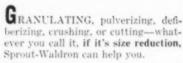
No electrical hazard in explosive atmospheres. A positive-acting pilot valve assures quick changes in transmission pressure, overcomes effect of minor leaks.

TRANSAIRE with Speed-Act is the latest step in Taylor's program to produce industrial instrumentation unsurpassed in accuracy and durability. Ask your Taylor Field Engineer or write for Bulletin 98140. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada. Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

* Registered Trade-Mark

IN HOME AND INDUSTRY





Water softening granules from ion exchange resins . . . a cottony fluff from sheet pulp . . . moulding stock from continuous sheet thermoplastics — these are typical applications in which Sprout-Waldron experience and equipment have been outstanding.

Every day S-W Engineers are transforming new and varied size reduction problems into more profitable operations. Whether your processing calls for the usual or the unusual approach, first learn what Sprout-Waldron can do for you!

Outline your size reduction problem today! Contact Sprout, Waldron & Co., 15 Waldron St., Muncy, Pa.



stricken employees; what the Company provides in the way of insurance; what our medical facilities are and how they were used in this specific instance.

In Strikes—Impress the press with the fairness of the Company's offer, with the economic soundness of the Company's stand. Provide data on previous wage raises and attempt to show that our wage rates are in line or above those of the area. This should not be hard to do since it is Company policy to pay rates as high or higher than "going rates" in the communities in which we operate.

When Price Increases Are Necessary—Virtually all increases are made necessary by rising material and labor costs. Point to the increased costs of our basic materials, using actual figures of possible.

if possible.

There are, of course, times when a newspaperman's question cannot be answered directly, either because the answer is not known or because it involves matters which might jeopardize our competitive position.

If we do not know the answer, we should say so, but, at the same time, offer to try and get it.

If answering the question would involve the giving away of professional secrets, we should say so frankly, pointing out that the information, amassed by us at great cost and effort, would be joyfully received by our competitors. There may be other valid reasons for not answering a question, but in each case, the press should be told why we cannot answer it and the reason should be logical and understandable to the layman.



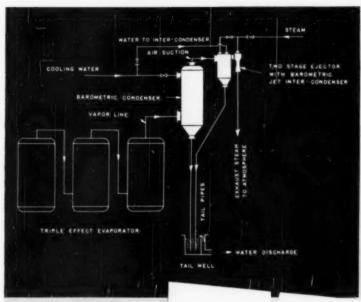
Suspicion is fatal

A newspaperman understands such an attitude and accepts it. After all, his business is competitive, too.

But unless there are valid reasons, refusal to anwer questions only arouses suspicion, and suspicion stirs a newsman to investigation.

Our Company is so operated that it can stand any kind of investigation. But no company can stand constant suspicion—whether it be warranted or not.

—End





denser and Two Stage Tubejet, pictured above, with Barometric Inter Candonser serving a Triple Effect Evaporator.

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You know what vacuum you want and C. H. Wheeler engineers know how to get it, using standard C. H. W. Tubejet ejectors, boosters and C. H. W. Inter and/or After Condensers of Barometric or Surface Type.... A specified vacuum can often be obtained in several ways, that is, by several combinations of standard equipment. The problem thus becomes one of engineering your conditions, and C. H. W. equipment, to obtain the desired vacuum in the most economical manner.... Because of long experience in vacuum engineering, probably no problem is new to C. H. Wheeler, thus C. H. W. guarantees of vacuum and performance carry an extra assurance of satisfaction in that "your problem or one similar has been solved before." Catalog on request.

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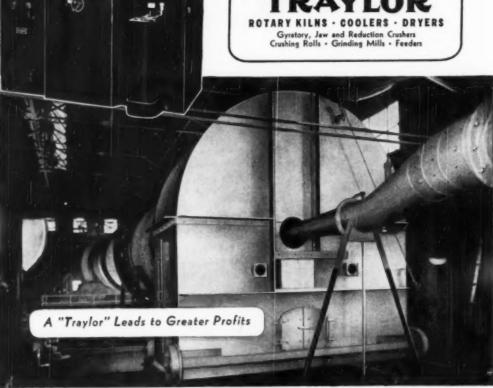
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The central control station of a Traylor Rotary Kiln is a feature as important as the exactness of its design and assembly-rigid, all-welded steel shellcut steel driving gear-floating-type riding ringsimproved supports and individual planning and construction.

Write today for full details of Traylor Rotary Kilns.

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Chemical Engineering News

RICHARD F. WARREN, Assistant Editor



Fiberglas for the West. Owens-Corning's newest unit opened in June.

Owens-Corning Meets Growing Demand With New Fiberglas Unit at Santa Clara

Chemical process industry boosters in the west are cheering the arrival of a new unit. Owens-Corning Fiberglas Corp. is making glass fibers and fabricating them out there. The new facilities (unofficially said to cost close to \$7 million) occupy 346,000 sq. ft. of a 42 acre site at Santa Clara., Calif. They went on stream this month. They have been under construction for more than a year. Capacity is about 50 tons of Fiberglas products daily, says Vice President L. R. Kessler, general manager of the firm's Pacific Coast division.

The new plant will use many raw materials: soda ash, borax, salt cake, high-calcium limestone, dolomite, high-alumina silica, phenol-formalde-hyde resins, mineral oils, special grades of asphalt, high-melting resins (Vinsol), fuel oil, paper. The resins are used as binders, the mineral oils as a fiber lubricant, the asphalt as a coating and impregnating composition, the paper as a facing material. All others are used in making the glass melt. The silica sand has about 50 percent feld-spar which serves as the source of Al₂O₂.

The unit (the firm's seventh in the United States and Canada) has one glass-making furnace, one wool line and other auxiliary facilities. Raw materials for the furnace are weighed

automatically and carried by belt conveyor to a 56-cu. ft. mixer. Batch buckets carry the mix by tramrail system to the arched, firebrick-lined furnace. It is like any furnace used to make bottle glass.

But here the similarity stops. The molten glass flows through perforated bushings in the forehearth of the furnace. As the melt streams go into a forming hood they are hit by a blast of high-pressure steam that draws them out into long, resilient fibers. The fibers have a diameter range of 0.0006-0.00005 in. The length and diameter of the fibers are regulated by controlling the temperature and viscosity of the glass melt, the size of the orifices and the pressure of the steam. Resin binders are added as needed at this drawing-out stage.

Fibers, which are now interlaced in an intricate way, are gathered on a travelling conveyor as a white, fluffy mass; the depth of this mass is controlled by the speed of the conveyor. The length of the production line (the conveyor is a part of it) is about 250 ft. It was designed and largely built by Owens-Coming engineers. In the machine the fibers are pressed into matts of any desired thickness. These pass through an oven to dry the binder; they are then trimmed to size and coated with asphalt and paper if de-

sired. Products coming off the end of the line are stored for shipment throughout the west. Asphalt goes through steam-jacketed lines and pumps to a heater. Then it passes through electrically heated lines to a fiber coating or impregnating department.

P. L. Welsh is production supervisor at Santa Clara; G. W. Nielson is plant engineer; R. J. Paoletti is chief process engineer. James A. Tomlinson is manger of the technical control department. The plant has a water treating unit that can deaerate and soften 128,000 lb. of water hourly for the boilers and the process. It has two 40,000 lb. boilers.

Fiberglas products made at Santa Clara will find their way into many kinds of buildings, home appliances, industrial plants, aircraft, cold storage units, trucks, trains and trailers. So says W. C. Winterhalter, who is vice president and sales manager of the firm's Pacific Coast division. "And as Western markets grow, we'll make more and more products at Santa Clara," he adds.

Basic glass fibers, in the form of rolls and blankets, are widely used as an insulating material. A new material Aerocor) with superfine fibers will be used on the West Coast principally in the insulation of aircraft. For the chemical, petroleum and other processing industries, Owens-Corning offers materials for protecting underground pipes, filters for gases and liquids, insulation for tanks, pipes and irregular vessels, tower packings and other products.

MCA Elects Officers and Plans Merger with SOCMA

The long talked of merger of Manufacturing Chemists Association and the Synthetic Organic Chemical Manufacturers Association has almost become a fact. MCA, at its annual meeting, approved the merger and a committee is at work ironing out the details. The actual formal merger won't occur until SOCMA also gives its approval.

At the annual meeting of MCA held in June the following officers were elected: chairman of the board, William M. Rand, president, Monsanto



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News, cont. . .

Chemical Co.; vice chairman, Charles S. Munson, chairman of the executive committee of U. S. Industrial Chemicals, Inc., and chairman of the board of Air Reduction Co.; and president, George W. Merek, president, Merek & Co.

Speaking at the meeting, Charles S. Munson, retiring president, said:

"If the price picture is to be as flexible as history suggests, then it seems evident that our answer to the problem of replacement capital should rest on an equally flexible foundation. And the logical way to do this, even under the 'original cost' concept, is to provide greater latitude to management in determining the rate at which this total allowable amount may be depreciated."

Adequate depreciation policies are imperative, Mr. Munson believes, to maintain this nation's productive ca-

"Any deterioration in our productive capacity would be a body blow," Mr. Munson said, "not only to America's living standards, but to the very future of our free civilization. For without the deterrent of America's industrial supremacy, the cold war could easily turn into an inferno overnight."

Many people, in government as well as out, have advocated a change in the tax system to allow more realis-tic depreciation rates. This sympa-thetic attitude, however," Mr. Munson said, "will not be transformed into legislative actuality without concentrated and well-organized efforts on the part of business. A new political hurdle has arisen in the form of a prospective federal deficit—what a frightening thing that is: a deficit at the peak of peacetime prosperity! Any attempt now to reduce the number of tax feathers plucked from the industrial goose is doomed to failure unless the public benefits have been made crystal clear, not only to Congress but to the entire voting public.

"There are as many recommended answers to the problem as there are people who talk about it," Mr. Munson continued. "No real progress will be possible until this babble of voices can be harmonized into a mighty chorus demanding action."



New chemicals for industry is the aim of this new research center.

Carbide Opens First Units Of New Research Center

One of the most versatile chemical research centers in the world is being put into operation at South Charleston, W. Va. G. O. Curme, Jr., (vice president of Carbide and Carbon Chemicals Corp. and vice president—chemicals research, Union Carbide and Carbon Corp.) says this new organic chemical research center will be the largest single laboratory project the firm has ever undertaken.

It was built to continue and expand the basic research work that, in the past, has given birth to many wellknown chemical products. The new establishment is equipped to provide recently developed requirements for chemical research. As typical examples of the many unique features, ingenious supports in each laboratory permit complete versatility in the location of laboratory furniture and equipment, and each laboratory can draw on any one of 14 separate utilities from permanent outlets—including such unusual services as cold brine, oxygen, hydrogen, nitrogen, and steam at either 15 or 200 psi.

At present only the main research building, devoted to basic research, is being occupied; four large development buildings are to be occupied in the future. The completed project will eventually house fundamental organic chemical and resin research, as well as process development work.

The programs in the new research center will concentrate on the design of new chemical molecules. Research will be directed to the development of new plasticizers, new synthetic resins, and new organic chemicals for agricultural and other uses. This work, as in the past, will continue to be supplemented by the heavy programs of research on the applications of chemicals in the organic synthesis and chemical hygiene fellowships sponsored by the company at the Mellon Institute of Industrial Research, Pittsburgh, and in the biological research fellowship at Boyce-Thompson Institute of Plant Research, Yonkers, N.Y.

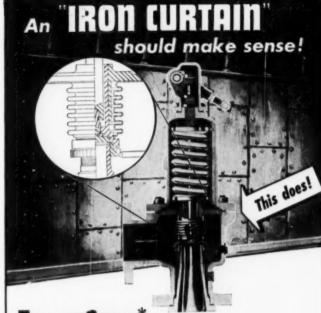
Investigation of chemical reactions at extreme pressures is an important part of the Carbide and Carbon Chemicals Corp. research activities. For this purpose a separate high-pressure laboratory building is located at the back of the plot. High-pressure equipment is housed in individual cells facing a high earth bank. An 18-in, reinforced concrete barrier separates the control corridor from the cells and protects operating personnel. In front of the control corridor are laboratory and work rooms. The partition walls between cells are made of two 4-in. steel plates separated by 3 in. of sand fill. Access to the cells is provided by aisleways. Equipment that is out of service can be reached for servicing without going in front of any equipment that may be op-

Bennett Adds Alkyd Unit at Salt Lake

Wallace Bennett, top man in Bennett's. Inc., Salt Lake City, and president of the NAM, has good reason to stick out his chest about his paint manufacturing business. It was built up by his family during the past 67 years until now the plant is the largest paint producer in the Intermountain area; it is often considered a model of its kind and size. Present facilities were set up late in 1947. They cost \$1 million.

Now Bennett's has put in a modern alkyd resin unit. It is the first of its kind between the Pacific Coast and the Mississippi. The 750-gal. kettle output will be used solely by the Salt Lake City plant. It will also be used for processing oils and varnishes.

Plant Superintendent Lyman P. Hunter is well pleased with its performance. Features include electric immersion heating units jacketed around the kettle. The set-up was de-(Continued)



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Is the READY Answer To Safety Valve Corrosion Problems:

The next time you need safety valves, don't worry about corrosion. Just remember the FARRISEAL "iron curtain"—the protective Stainless Steel Bellows. Just remember what this original FARRIS development

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ALWAYS SAFE—bound to open at set pressure.

No other safety valve has these FARRIS features. Only FARRIS has designed a stock line of safety and relief valves especially for service where corrosive conditions may make ordinary valves useless.

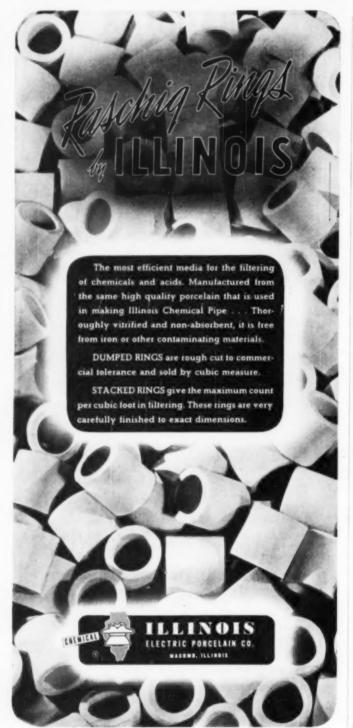
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News, cont. . . .

signed by Blaw-Knox Co. cooperating with Hunter and Chemical Engineer John Holmes. Plant design allows the finished solids to flow by gravity into a 1,200-gal. reducing tank.

John Holmes and George Jensen have direct charge of the alkyd operation. Orson Goodvear is assistant superintendent at Bennett's Salt Lake City plant. Along with Lyman Hunter, they are all chemical engineers.

Serious Hazard Criticisms Threaten Pesticides

Criticism of pest control chemicals has recently developed in alarming proportions. National Agricultural Chemicals Association has taken account of this threat to the whole insecticide industry. It has named a special liaison committee to work with it, with members from outstanding Federal, State, educational, and contemporary industry organizations.

Involved are difficulties or criticisms resulting from improper use of DDT, 2,4-D, toxaphene, and parathion, among others. Personnel hazard, food contamination, and economic damage

(Continued)

CONVENTION CALENDAR

United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N. Y., August 17-September 6.

American Institute of Chemical Engineers, regional meeting. Mount Royal Hotel, Montreal, September 6-8.

American Chemical Society, 116th national meeting, Atlantic City, N. J., September 18-23.

American Society of Mechanical Engineers, petroleum division, engineer-ing conference, Oklahoma Biltmore Hotel, Oklahoma City, October 2-5.

American Gas Association, annual convention, Chicago, October 17-21.

Packaging Institute, annual forum, Commodore Hotel, New York, October 24-26.

Technical Association of the Pulp and Paper Industry, engineering conference, Statler Hotel, Boston, October 21-November 3.

Second Pacific Chemical Exposition and Industrial Conferences, Civic Auditorium, San Francisco, November 1.5.

22nd Exposition of Chemical Industries, Grand Central Palace, New York, November 28-December 3.

American Institute of Chemical Engineers, annual meeting. William Penn Hotel, Pittsburgh, Pa., December 4-7.

This is WHY YOU GET LONGER EQUIPMENT LIFE with Carpenter Stainless Tubing



Manifold for a 2-pass circulating heater. Rolling-in of Type 304 Carpenter Stainless Tubes reported to be easy, due to the consistent wall uniformity of material supplied from distributor stocks.

LESS DOWN-TIME on process jobs because there are no "off gauge" areas that might cause premature tube failure due to corrosion or heat scale.

SIMPLIFIED FABRICATION results in a good job that is built to last when you work with the exceptionally uniform walls of Carpenter Stainless Tubing.

To satisfy yourself that there really is a difference in the Stainless Tubing you can buy today, send your next order to your Carpenter Stainless Tubing Distributor.

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NEW FILE OF DATA ON STAINLESS TUBING

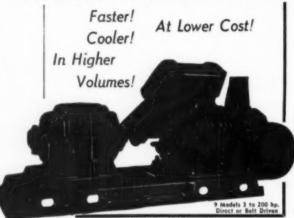
This file will give you data on Carpenter Stainless Tubing physical properties, corrosion resistance, sizes available, etc. For your copy, just write us a note on your company letterhead.



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JAY BEE HAMMERMILLS OPERATE AT TOP EFFICIENCY ON ANY MATERIAL TO BE GROUND

Jay Bee Hammermills are centrifugal in type with multiple cutting hammers that travel at speeds in excess of 20,000 ft. per minute. Material fed into the mill is suspended over the hammers until it has been shattered to size. Finished particle size range from minus 1/64" to 1½". For additional information, write to J. B. Sedberry, Inc., Franklin, Tennessee, for folder CE-449

THE ONLY MOILL WITH CONSTANT FEED CONTROL. The new, revolutionary "Constant Feed Control" creates "Suspension Grinding," There is no rob-bing between motal sortface or occupa, chill, IAY BEE grinds many materials to power Resease.

FREE GRINDING TESTS OF YOUR MATERIAL Send ut a sample of the material that you wish to grind and advise as to what fineness you wish to ground, capacity per hour and power available. We will return the ground meterial with recommendations os to the mill best suited to your needs. There is no charge for this service.

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News, cont. . .

in rural areas represent either real or claimed dangers.

Certain constructive efforts by Department of Agriculture and by Food and Drug Administration to prevent milk contamination by DDT are commended by NAC. But certain secondary results of alarmist publicity or speeches by publicity-seeking persons are very differently regarded and are a cause of serious industry concern.

Cooperative action with all appropriate agencies, will, it is hoped, result in eliminating some over-enthusiastic selling, certain unwarranted "official" recommendations, and neglect of adequate label precautions by careless users. "In some cases we need more facts, but more important is education as to known facts regarding safe practice." This is the substance of the feeling of the industry association as summarized by one of the active participants in the recent NAC sessions. The collapse of the DDT market

The collapse of the DDT market with huge losses by certain firms in the industry is cited as only one example of the serious consequences which will come to both producers and dealers, if corrective measures are not promptly taken. Concerted action of the industry seems assured from the enthusiastic support at the recent convention.

Wyandotte Names Semple To President's Post

In September Wyandotte Chemicals Corp. will get a new president. Robert B. Semple will succeed E. M. Ford who will become chairman of the board. Mr. Semple has been director of development at Monsanto Chemical Co. He joined Monsanto in 1934.

He graduated from MIT in that year with a master's degree in chemical engineering. Since that time he has been a research chemist, pilot plant group leader, sales manager of petroleum chemicals and director of Monsanto's general development department. He is a native of St. Louis.

SPI Holds Annual Meeting in Chicago

Society of the Plastics Industry held its annual meeting in Chicago recently. At the meeting George T. Felbeck, vice president of Carbide and Carbon Chemicals Corp., was presented with the Hyatt award. He received it for his distinguished achievements in polyethylene work.

Newly elected officers were named at the meeting. President is Horace (Continued)

A New

DRY CHEMICAL EXTINGUISHER

igger-Finger Control

Here, at last, is an extinguisher that's designed right to make the most effective use of an effective fire-extinguishing agent. Kidde Dry Chemical Extinguishers-made in 20- and 30-pound capacities—are operated simply by pulling a trigger—the same familiar, time-tested method used on all Kidde* carbon dioxide (CO₂) extinguishers.



these 10 other big features

- 1 Simultaneous opening of CO2 and powder values. No trapping of gas pressure in powder chamber before the discharge starts.
- 2 Quicker transfer of pressure to powder chamber. Siphon tube carries CO2 to outlet in powder chamber, where it expands to a gas.
- 3 CO₂ cartridge easily replaced. Just loosen name band holding cartridge—then unscrew cartridge. Same size cartridge for both 20and 30-pound extinguishers.
- 4 CO₂ fluffs up powder—prevents packing. Small port at bottom of CO₂ outlet tube allows gas to stir up powder
- 5 Powder discharges from top through siphon. No danger of packing at hose
- 6 Powder filler cap needs no tools. Unscrews easily for refilling of extinguishers in the field. Filler cap is safety-vented.
- **7** Lightweight cylinder for ease of carrying. Pound for pound, the Kidde Dry Chemical Extinguisher packs more fire-fighting punch!
- 8 Better powder dispersion pattern. Dif-fusion baffle in horn gives greater coverage, more effective application. No shut-off valve in horn to trap powder under pressure in hose. No rodding out of hose after use.
- 9 Extinguisher tested for operation at
- 10 Improved powder and packaging. Powder specially processed to make it free-flowing; packed in weatherproof containers. 30-pound carton contains three 10-pound cans—for easy refilling of either 20- or 30-pound extinguishers. 50-pound containers also available.

Walter Kidde & Company, Inc. 728 Main Street, Belleville 9, N. J.



Walter Kidde & Company, Inc. 728 Main Street, Belleville 9, N. J.

Please send me further information on the Kidde Dry Chemical Extinguisher.

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News, cont. . .

Gooch, Jr. Mr. Gooch is founder of the Worcester Molded Plastics Co., Worcester, Mass. Other officers in-

clude: chairman of the board, George H. Clark, Formica Insulation Co.; vice president, J. J. B. Fulenwider, Hercules Powder Co.; treasurer, J. E. Gould; and secretary, William S. Perry.



Bigger and better production is the keynote at this new Berkeley plant.

Pacific P & V Modernizes Its Berkeley Plant

Pacific Paint & Varnish Co. recently expanded and modernized its plant at Berkeley, Calif. Its design engineers rearranged the paint-making layout for more efficient operations. They put in the latest type of equipment made in this country and England. "We have paid particular attention to ways for making our workers more comfortable and efficient," says Assistant General (Continued)





THAT KEEPS COSTS FROM PILING UP A SCORE

The more compressed air or gas you use, the more you can economize with Worthington Opposed Steam Driven Compressors. With over 50 years of development behind them, these rugged, tireless performers are up-to-the-minute in every last cost-saving detail. For example:

Pressure feed lubricates each side independently, reducing outage and maintenance to a minimum . . . full accessibility to all steam and air cylinder interiors by removal of rear cylinder heads only . . . modern, trouble-free bearings for uninterrupted service . . . and Worthington Feather* Valves, most efficient ever made.

Reduced Labor and Maintenance Costs

Following the Worthington formula, these modern Compressors combine high performance efficiency with minimum maintenance requirements. Their ability to do a better job, year after year, on amazingly low operating costs is familiar proof that there's more worth in Worthington.

Write for Bulletin L-680-BIA.
Worthington Pump and Machinery
Corporation, Compressor Division,
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WORTHINGTON



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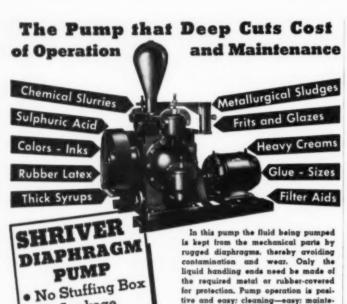












for protection. Pump operation is positive and easy: cleaning—easy: maintenance—negligible. Delivery pressures to 100 p.s.i. Capacity—I to 100 g.p.m. Write for Bulletin 126.

No Wear on
 Working Parts

10 100 pai. Capacity
Write for Bulletin 128.

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802 HAMILTON ST.

No Leakage

HARRISON, N. J.



News, cont . . .

Manager W. T. Butner. To cut down noise and vibration, all heavy equipment has been mounted on cork.

The modern \$1 million plant uses a unique system of control on its two new 1,000-gal. resin kettles and its 250-gal. experimental unit. These are fired by two-burner direct, radiant gas heaters. These give rapid heating, yet a combination valve setup regulates the heat balance by (1) lighting both burners, (2) lighting only one burner, or (3) turning off both burners and sending cooling water through the coils. When used with electronic instruments, the system gives sensitive control. Each kettle has its unit control equipment mounted on an adiacent panel; in addition, there is a remote control room for logging all kettle variables. A special two-speed agitator gives mechanical stirring. A N.CO, mixture from a Kemp generator gives additional mixing and provides an inert blanket of gas.

All raw materials are palletized. They are spotted as near as possible to the processing equipment. Grinding oils and varnishes are pumped from outside storage tanks. Each line has an individual pump that is controlled by a pressure tank system. The plant operator opens a valve and the flow is automatically started. New streamlined production lines increase the accuracy and speed of filling and handling the cans. The tank farm holds more than 250,000 gal. of oils and

varnishes.
Pacific Paint & Varnish Co., founded in 1926, now makes alkyd resins, modified maleic and phenolic resins, treated oils, and modern line of technical paints, varnishes and lacquers. It has emphasized the importance of research and control by doubling the size of its laboratories. The staff includes A. B. Robertson, president; W. G. Beauchamp, vice president and general manager; W. T. Butner, assistant general manager; G. J. Grieve, technical director; S. U. Greenberg, resin plant manager; and W. F. Rhoades, chief resin chemist.

CCDA Meets At Niagara Falls

The open meeting of the Commercial Chemical Development Association was held at Niagara Falls, N. Y., in June. It brought forth fresh viewpoints in development techniques in the field of heavy tonnage, inorganic chemicals. There was a special program of entertainment for the ladies, an innovation in CCDA meetings.

The morning session opened with introductory remarks by the chairman,

Naphtha Process Wool Scouring Preferred by America's Largest Wool Grease Producer

Superior Wool and Wool Grease Result from Process Used Successfully for over 50 Years

Though the bulk of the nation's wool processors still scour wool by the traditional "soap and water" emulsion process, William Whitman Co., Inc., Arlington Division has been using the Naphtha Process with outstanding success for more than half a century. As the nation's largest single recoverer of wool grease, Arlington prefers solvent extraction as a more efficient method of recovering the grease. It also improves the strength and softness of the finished wool.

3 Steps in Extraction

Arlington uses two batteries of kiers, or digesters, with a total capacity of 10,000 pounds. After the kiers are loaded, they are sealed and the air is pumped out to a 25-inch vacuum.

In the first step, the wool is in contact with 5,000 gallons of twice previously used Esso Hexane, until this solvent is saturated with wool grease. After this naphtha is emptied, 2,000 gallons of intermediate naphtha (used once) is then introduced into the kiers and kept there for a certain time interval. When this intermediate Hexane is emptied, 3,000 gallons of pure Hexane is then used. This completes the degreasing procedure. After all the free liquid has been drained off, the final traces of

> solvent left in the wool are driven out with a heated inert gas and finally vacuum dried.

Wool grease is used in compounding lubricants, greases, rust preventives, cutting oils, in leather and fur dressing products, and as a basic ingredient for animal vitamins such as irradiated cholesterol.

at Arlington Mills

In the early history of this process, wide-cut petroleum solvents were used. Since early 1948, however, Arlington has used Esso Hexane. one of the new, highly refined closecuts. Featuring a boiling range of less than 15 F and a high degree of purity, Esso Hexane costs no more than many solvents with much

Esso offers a large selection of solvents with a variety of evapora-



Naphtha Process wool scouring produces superior quality tops and yarns.

Esso Hexane Now Used

wider boiling ranges

PETROLEUM SOLVENTS

tion rates. Our technical men will

be glad to analyze your solvents

problems without any obligation.

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Solvents, drop a line today to our

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CHEMICAL ENGINEERING-July 1949

Aliphatic Hydrocarbons

Cut Costs in Ethyl

Cellulose Lacquers

To prevent yellowing of finishes

in blonde and bleached wood

furniture, the lacquer base of nitrocellulose is replaced with

ethyl cellulose. The preferred solvent combination consists of

70.90% aromatic hydrocarbons

with 30-10% alcohols. For even

more economical solvent mix-

tures, petroleum distillates such

as Esso Heptane and Esso

VM&P Naphtha can be used to

replace a high percentage of

the aromatics. An excellent

combination for uniform evap-

oration is isopropyl alcohol

used in conjunction with Sol-

vesso Toluol and Esso Octane.



PHOTOSWITCH Level Controls, effective for all conductive liquids, are available for single-level indication or control, on and off pump control, and holler feedwater control.



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News, cont. . .

George F. Rugar, assistant manager, technical service division, Diamond Alkali Co. Following Dr. Rugar's remarks W. J. Riley, manager of the technical sales division, Westvaco Chemical Division, Food Machinery Corp., spoke on "Continuing Development of Markets for Old Chemicals."

Taking "Hydrogen Peroxide" as his example J. S. Reichert, manager, peroxide products development, electrochemical department, E. I. du Pont de Nemours & Co., illustrated "how the market for a long known chemical may be expanded through technical improvements in manufacture, distribution and applications."

At the luncheon R. B. MacMullin, of R. B. MacMullin Associates spoke comprehensively on "The Chemical Industry of the Niagara Frontier," long one of the most important producing areas for industrial chemicals.

In the opening paper of the afternoon session, L. S. Roehm, assistant general sales manager, Dow Chemical Co. carried on the theme of the meeting in "The Story of Hydrochloric Acid."

In the next paper, "Phosphorus Compounds," J. M. Gillett, director of industrial research, Victor Chemical Works, dealt historically with the development of the phosphorus compounds industry and the widely diversified current applications for those compounds.

The final paper, "The Place of Sulphuric Acid in the Heavy Chemical Industry," was presented by E. Wick Eddy, sales department, Texas Gulf Sulphur Co. Mr. Eddy's presentation was a concise summary of the use of sulphuric acid in industry.

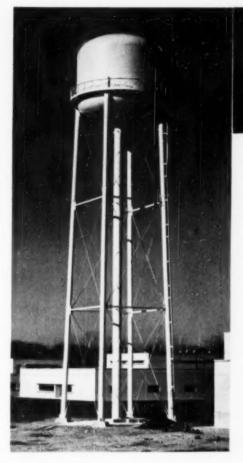
After social hour and dinner the meeting was brought to a close with an address on "Flavors, Spices and Perfumes," by E. C. Crocker of Arthur D. Little, Inc.

Sulphur Export Corp. Denies Deal With Italy

Sulphur Export Corp. is not planning any agreements with Italian sulphur producers. So says Clarence A. Snider, president of that firm.

Mr. Snider stated that there was no basis for the statement by Calogero Volpe, president of the Italian sulphur organization, in a recent interview by the Associated Press in Rome in which he indicated that an agreement was being awaited. In fact, Mr. Snider added, there has not even been any discussion looking toward any agreements.

(Continued)



HORTON ELEVATED TANKS provide "double-duty" water service

as "fireman"

The 100,000-gal. Horton elevated tank at the left was installed recently by G. D. Searle and Company of Skokie, Illinois, to provide a secondary water supply for its automatic sprinkler system. Primary water supply for this 4,000,000 cu. ft. plant is taken from a city water main by a booster pump. Even if the pumping system is disabled, a dependable, gravity supply of water is ready to flow the instant a sprinkler head opens. This is important, particularly at night when employes may not be present to discover fires.



as "serviceman"

The Diamond Alkali Company of Houston, Texas, had the 50,000-gallon Horton ellipsoidal-bottom elevated water tank, shown at the right, erected recently to provide a dependable source of water for general plant service.

Elevated storage makes it possible to pump a large part of the water during off-peak periods. This generally lowers pumping costs and adds to the life of pumping equipment. The gravity head provided by the tank will also maintain adequate pressure in the system when the pumps are shut down.

Horton ellipsoidal-bottom elevated tanks for industrial service or fire protection are available in capacities from 15,000 to 500,-000 gallons. For quotations, contact our nearest office.

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DOYLE & ROTH MFG. CO.

FOOT of 23rd St. Brooklyn 32, N. Y. News, cont. . .



Electrochemical Society members were guests at Penn Salt's Whitemarsh laboratories during their 94th annual meeting at Philadelphia.

Electrochemical Society Elects New Officers

The 94th national meeting of the Electrochemical Society was held at Philadelphia. It was the largest and one of the most important in the history of the Society. The technical program comprised 75 papers on luminescence, rare metals, theoretical electrochemistry, corrosion, electrodeposition, batteries and electroorganic chemistry.

The newly elected officers are: Alfred L. Ferguson, president, professor of chemistry at the University of Michigan; J. C. Warner, vice president, professor and head of the department of chemistry and dean of (Continued)

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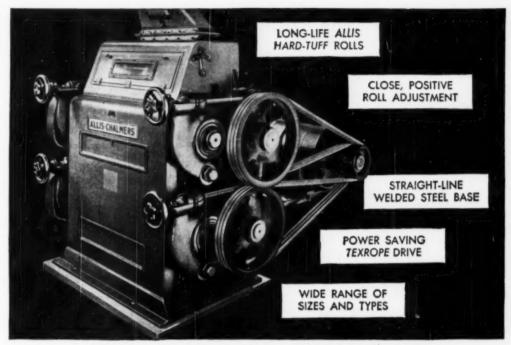
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News, cont. . .

graduate studies at Carnegic Institute of Technology; Henry B. Linford, secretary, professor of electrochemistry at Columbia University; E. Gideon Widell, treasurer, a member of the research staff of Radio Corp. of America.

ASEE Adds Nine Schools To Research Council

Nine schools were elected to active membership in the Engineering College Research Council of the American Society for Engineering Education in June.

The new institutions accepted into membership are the University of California (Los Angeles), Catholic University of America, University of Arkansas, University of Denver, Montana School of Mines, Northeastern University, University of Notre Dame, Tufts College, and Wayne University. Each has qualified for membership by virtue of the extent and quality of the engineering research conducted at the institution.

The announcement was made by Dean Dawson of Iowa State at the annual meeting of the Engineering College Research Council at Rensselaer Polytechnic Institute, in Troy, N. Y.

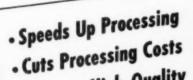
New members of the Research Council's executive committee, also amounced at the annual meeting, are Thomas L. Joseph, assistant dean of the School of Mines, University of Minnesota; J. Hugh Hamilton, director of the Utah Engineering Experiment Station, University of Utah; and Albert G. Conrad, head of the department of electrical engineering, Yale University, Roy M. Green, dean of the College of Engineering, University of Nebraska, was renamed to the executive committee and will serve as a vice chairman of the council.

Fifteen hundred educators, scientists and industrial leaders met at Rensselaer Polytechnic Institute, in June for a five-day symposium on the future of engineering. The occasion marked the 57th annual assembly of the American Society for Engineering Education and honored Rensselaer which this year celebrates the 125th year of its founding as the nation's first college devoted solely to science and engineering.

The convention speakers' roster was headlined by notables including George V. Allen. Assistant Secretary of State and former Ambassador to Iran; C. H. Greenewalt, president of E. I. du Pont de Nemours & Co.; Marvin E. Coyle, executive vice president of General Motors Corp.; Ray-

(Continued)

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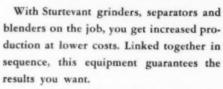
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News, cont . . .

mond R. Walters, president of the University of Cincinnati, and many others.

Theme of the meeting was "Education's Partnership with Industry."

CMRA Elects Officers at New York Meeting

Chemical Market Research Association elected officers for the 1949-50 term last month. At the annual meeting, held in New York's Biltmore Hotel, George W. Russell, American Cyanamid Co., was named president. He succeeds S. P. Gibson.

Among the other officers elected are: Vice president, E. K. Burger, Esso Standard; recording secretary, Paul Weller, Wyandotte Chemicals Corp.; corresponding secretary, Fritz Von Bregen, Westvaco Chemical Division of Food Machinery and Chemicals Corp.; and treasurer, E. H. Bohle, Jefferson Chemical Co. R. B. Schneider, A. D. Little, Inc., and A. J. Fisher, U. S. Industrial Chemicals, Inc., were elected councilers.

At the technical session, three papers on various phases of market research were discussed. Morris Leland, Shell Chemical's manager of economic research, used synthetic glycerine as a case history in economic research. He discussed the problems faced by Shell in deciding on the profitability of making synthetic glycerine.

Attacking an overseas market research problem was the subject of a second technical paper. Winn W. Chase, director of market research, textile colors division, Interchemical Corp., spoke on this subject. He described the method followed by Interchemical in making such a study. The first step was assembling information on markets for textile coloring material in each textile producing country. The second step was to analyze these data and find out where sales efforts should be concentrated. Third step was to conduct a first-hand investigation of the major markets. Ten countries have been visited. These studies are bringing to light a great deal of specific information.

Market research in the textile industry was discussed by E. F. Altmier. He is manager of the planning section, rayon division, E. I. du Pont de Nemours & Co. He described the function of market research as "taking the guesswork out of business." Mr. Altmaier told of several studies conducted by Du Pont and illustrated his talk with examples of conditions which existed in the past that are strikingly

(Continued

Separating solid from solvent this new way saved time, materials, costs







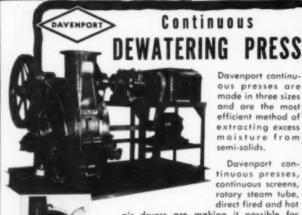




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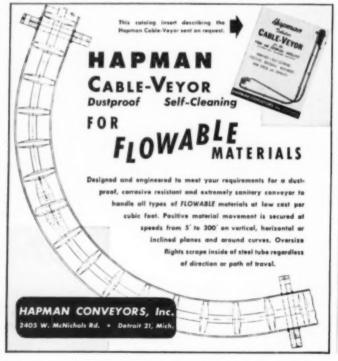
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NEWS, cont. . .

similar to present conditions in the rayon industry. By plotting the rayon production between September 1936 and March 1939 and then comparing these figures with those of February 1948 to date, he showed the very close correlation between the two periods. He estimated that April rayon production was probably the low point in a cycle and that second half output should rise considerably.

R. L. Murray discussed the "chloralkali" industry in the United States at an evening session. He is executive vice president of Hooker Electrochemical Co. R. C. Swain, vice president, American Cyanamid Co., introduced

READERS' VIEWS AND COMMENTS

More About Ejectors

To the Editor:

Sir:—We were very much interested in the article "How Ejectors Are Developing," p. 136, in the Fluid Flow symposium in your May issue. We are sure that the information you give will be of substantial benefit to many users and prospective users of vacuum equipment. As manufacturers we have specialized in the design and development of ejectors for over 30 years. We want to endorse with enthusiasm most of the comments you have made.

You may also be interested in a slight difference of opinion on a couple of points. At the end of page 136 you mentioned "water requirements are always higher than for other types of vacuum producers." This is true of all vacuum equipment which uses one or more condensers between stages. However, the chemical processing industry uses thousands of single stage ejectors and hundreds of twostage non-condensing ejectors which use absolutely no water at all. In many cases the exhaust steam is used for process heating which means that the operating costs for the vacuum is [Correct: We were renegligible. ferring to condensing ejectors.-Edi-

In regard to the statement, "low loads are likely to cause instability,' this is true in general. But where such instability at low load is a disadvantage and where the ejector builder is so notified in advance full stability can be provided down to zero load by using a small amount of extra steam.

We particularly want to comment (Continued)

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All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against

leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steeliron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

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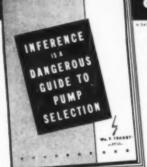
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The unbiased, basic facts concerning types of pumps are contained in our special bulletin S-146. Big illustrations and

briefed descriptions deal with the capacities and adaptability of such types as piston, plunger, rotary and centrifugal pumps.

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READERS' VIEWS, cont. . .

about your paragraph on four- and five-stage ejectors. You mention five-stage ejectors. These units are expensive to operate. Their performance is difficult to measure with existing gages and they require absolutely dry steam for operation." The only cases where four- and five-stage ejectors are more expensive to operate than other types of vacuum equipment are those where the smallest practical size ejector has substantially more capacity than required for the particular job. Mechanical vacuum pumps are made in smaller capacities. In fact the largest mechanical vacuum pump available has substantially less capacity than the smallest four-stage ejector which we consider practical. This does mean that for many installations suitable performance can be obtained with mechanical vacuum pumps at less cost, but we want to emphasize that, per unit of capacity, a four- or five-stage steam jet is always less expensive to operate.

When you consider that these multi-stage ejectors are frequently handling vapor loads which would be impossible for any mechanical pumps, their advantage is even more important. There are many cases where the four- or five-stage ejector (besides eliminating mechanical vacuum pumps with their moving parts and necessity of changing oil) have also climinated expensive low temperature condensers, two-stage refrigerating compressors, dry-ice traps or the equivalent. In addition, these ejectors give more factor of safety against leakage. In some cases they eliminate the need for expensive instruments and tedious testing for small leaks. A mass spectrometer costs several thousand dollars. The operation of one requires the detailed attention of a high grade technically trained scientist. In some cases such instruments could be avoided if a little extra capacity in vacuum equipment were available.

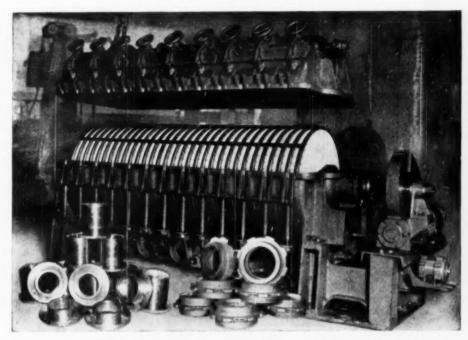
You mention that performance is difficult to measure with existing gages. This, of course, would apply to any type of vacuum producer to the same extent that it does to ejectors. We agree there has been difficulty in measuring most pressures but in our opinion recent developments have provided dependable vacuum gages for the complete range of pressures at which ejectors operate. This includes absolute pressures as low as a very few

In regard to your comment about the necessity for absolutely dry steam, this has caused trouble in some installations but in our opinion such trouble (Continued)

Centrifugally Cast

ACIPCO STAINLESS STEEL

TUBES AND PARTS



Vallex Rotary Filter designed and manufactured by Gaslin-Birmingham Manufacturing Company. Top of filter is raised to show filtering screens. Grouped about filter are some of the Type 316 Stainless Steel Filter castings furnished by ACIPCO.

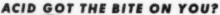
To protect their enviable reputation in the manufacture of rotary filters this company uses ACIPCO Stainless Steel castings. For the filter shown, ACIPCO furnished 18% Chrome—12% Nickel—2% Molybdenum stainless steel filter hubs, bushings, glands, stuffing boxes, inspection bosses, discharge spindles and centrifugally cast stainless steel shaft 11.25" OD x 9" ID x 16'-0" Long.

ACIPCO can furnish both stainless and carbon steel castings produced in stationary molds, as well as stainless and carbon steel and alloy iron centrifugally cast tubes with outside diameters from $3\frac{1}{2}$ " to 50" and varying wall thicknesses from $3\frac{1}{6}$ " to 4". All tubes are cast in standard 16" lengths. ACIPCO is fully equipped with modern electric furnaces, complete laboratory and testing facilities, pattern and machine shops to produce and fabricate your casting requirements.

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Let Palmetto Blue Asbestos also take the bite out of acid problems as pressure-bonded Sheet, as Dry Blue Rope.

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READERS' VIEWS, cont. . .

is easily avoided. It is extremely simple to put in a small electrically heated superheater on the steam line for the first one or two stages. The current consumption is usually only about 1 kw., which is negligible.

D. H. Jackson

Ctoll-Reynolds Co. New York 7, N. Y.

Air Ejector Manual

To the Editor:

Sir:—I have read the article "How Ejectors Are Developing" in the May 1949 issue of Chemical Engineering and I quote from p. 137: ". . . Although performance figures are difficult to obtain, a few data have been assembled from various sources and are presented in the accompanying tables."

On p. 138 I notice you recommend as follows: "... Increased dissemination of information about ejectors by manufacturers, universities and research organizations will make possible more intelligent selection of units by buyers, resulting in fewer unsatisfac-

tory installations."

We agree most thoroughly with the latter statement and along these lines some two years ago we adopted the policy of disseminating information. We have distributed about 1,500 copies of our manual on air ejectors to interested engineers who use ejectors in their work. In this manual performance for single stage, two stage non-condensing, two stage condensing, and three and four stage condensing ejectors are listed for steam pressures 75 to 200 psig. Not only is the performance given but the list prices and dimensions as well. This tabulation gives the performance from 10 in, vacuum or 20 in, absolute pressure down to 1 mm. Hg absolute pressure. As far as we know, we are the only ejector manufacturer who has distributed this information.

The engineers to whom we have presented this manual have made good use of it and we do not think it has been detrimental to our business in any manner; on the other hand we are quite sure it has been to our advantage to distribute this information.

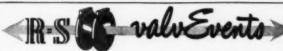
H. M. Graham Graham Manufacturing Co.

Batavia, N. Y.

CORRECTION

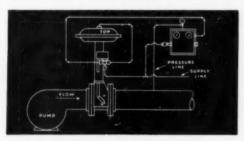
Packaging

The item "MCA Committee Meetings" on p. 192 in June contained an error and was incomplete. For correction see p. 170 of this issue. —End



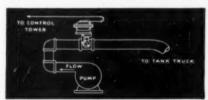
. EXCERPTS FROM THE R-S BOOK OF EXPERIENCE .

POWER OPERATED CONTROL OF DOWNSTREAM PRESSURE



A common application of R-S Valves is the power operated control and shut-off of downstream pressure or temperature. In the above diagrammatic drawing, the pressure or temperature controller (upper right) is actuated by the downstream pressure or temperature, and controls in turn the positioner and diaphragm top of the valve. Any liquid, gas or semi-solid can be controlled in this manner.

Accurate Measurement of Volume



The accurate measurement of oil, gasoline, chemicals, etc. pumped from storage tank to tank truck or other container is a simple matter when arranged as illustrated. The pump is started and the R-S Valve opened at the same time from the control tower. A flow meter automatically shuts off the pump and valve when a predetermined number of gallons has been reached.

The angular discs of R-S Valves seat at an angle of $12\frac{1}{2}$ ° to provide wedge-type metal to metal closure. These valves are rubber lined, rubber spool or rubber disc seated to provide positive 100% shut off.

For simplified control and shut off of volume and pressure, consult with your local R-S representative. You will find the address and phone number listed under "R-S Products Corporation, Valves."

R-S Products Corporation, Wayne Junction, Philadelphia 44, Pa.



No. 732. 30-Inch 50-pound Heavy Service Valve. Equipped with rubber spool, gear reduction drive and extended shaft. Limitarque Mater mounted above valve.



Ne. 735. 72-inch 125-pound "H" Metal Valve for elevated temperatures. Equipped with cooling fins, oil cylinder and positioner utilizing 200 psig oil and 0-15 psig instrument oir.



No. 742. 30-inch 150-pound Class B Steel Valve with air cylinder, cam driven positioner, hand wheel and declutching mechanism. Handles highly abrasive catalyst. Dewnstream cone replaceable.



No. 718. 18-inch straight Through Slide Valve. 150-peund American Standerd raised face flunges. Air cylinder operated. Rising stem handwheal operator with declutching unit. Suitable for handling liquids, gases and semi-solids including catalysts. Saturated

Aliphatic - - - Cyclic - - - Aromatic IVATIV

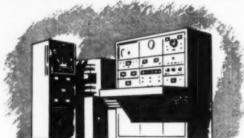
Unsaturated

Polyhydric — — Anhydric — — Substituted

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For further information on the analysis of solvents and derivatives, write to Department MS-1,

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News From Abroad

SPECIAL CORRESPONDENCE

Australia Looks Into Rayon Filament Possibilities

Melbourne—Ralph Steven von Kohom, son of Baron Oscar von Kohorn zu Kornegg (Oscar Kohorn & Co. Ltd., New York) is in Australia at the invitation of the Commonwealth Government to investigate the possibility of establishing a rayon filament industry.

Oscar Kohorn & Co. is one of the world's leading firms of designers of rayon and staple fiber plants. Austrianborn Oscar von Kohorn, from a small office in Tokyo's downtown district, nursed Japan's staple fiber industry from small, experimental beginnings to a leading position in the world's textile industry. Later, in the U. S., he designed continuous filament and staple fiber plants for countries in all continents.

Brazil's Rubber Output Drop Caused by U. S. Aid Cutback

Rio De Janeiro—With Brazilian natural rubber production dropping fast, authorities are concerned lest Brazil soon have to import this product, in which she once dominated the world.

U. S. subsidization of Brazil's production boosted output during the war years, and withdrawal of that help was a factor in diminishing production. Output dropped from 35,000 tons in 1945 to an estimated 22,000 tons in 1949.

Domestic demand this year is calculated at 23,000 tons, meaning only 1,000 tons must be filled from previous carryovers, but Brazilian officials figure on increasing demand from Brazil's tire and rubber goods manufacturers which should reach 36,000 tons in 1955.

Practically all Brazilian rubber trees



grow wild, and usually are scattered at wide intervals in the jungle. Collection of latex is therefore difficult, and rapid expansion of total output is unlikely. Henry Ford's efforts to grow plantation rubber in the Amazon ended in failure, with the Ford properties being turned over to the Brazilian government.

Austria Is Expanding Her Chemical Exports

Vienna—Austria soon hopes to add hydrocarbon chloride solvents, such as perchlorotheylene, to her export lists. Trichloroethylene is already an export commodity. Other chemicals being sold abroad are chlorine, liquid sodium hydroxide, carbide, magnesite sinters and bricks, caustic magnesite, and crude graphite. Paper accounts for better than 12 percent of the country's total export trade. Crude graphite is running out of the country's cars due to postwar loss of the traditional German market.

Monsanto Plans Further Expansion in Britain

London — Market developments have made the original plans for British Monsanto's big expansion program in Wales out of date.

Production levels set at first will have to be doubled and in some cases trebled, on some of the products to be turned out at the new factory at Newport, Monmouthshire, South Wales,

Research and development since 1947 has now made it clear that many more chemicals formerly imported from the U. S. can be turned out at Newport and at the company's main plant at Ruabon, North Wales.

Hence, the British firm, Monsanto Chemicals Ltd., which is associated with the American company, has offered another 600,000 shares of ordinary (common) stock to the public, at 52/6d. a share. Shares sold to the public back in May 1947 are now quoted at around 56/3d.

The American firm has agreed not to take up any of the new issue, so that on completion of the financing, the public will hold one-third of the total common stock.

Of the new products to be added the following are the most important: a vanadium catalyst for sulphuric acid plants, diphenyl and derivatives for clectrical industries, silicon chemicals for the electrical and metal industries, polystyrene and specialty plasticizers for the plastic industry—all products now imported from America; and synthetic adhesives for the plywood industry here and in the colonies, Syton (Continued)



PRIDE OF INDIA'S ALKALI INDUSTRY

This Tata Chemicals Ltd. caustic soda and soda ash unit is biggest in India. But transport and pricing problems have held up output. The Kathiawar peninsula plant has been forced to shut its ash unit.



1024 NEPPERHAN AVENUE, YONKERS 3, NEW YORK

FOREIGN NEWS, cont. . .

for the textile industry and additional chemicals for rubber manufacture. The manufacture of these products in the U, K, is estimated to replace imports from the dollar areas to the extent of some \$2,500,000 per year.

First production from the Newport factory began in May. The first group of products to be thus added to the line already offered by British Monsanto are all of U. S. origin: an alkyl benzene sulphonate, and an adhesive for lubricating oils, as a corrosion inhibitor.

Another application soon to be getting a greater play, is that of using sodium benzoate for impregnating wrapping paper as a moisture-inhibitor, preventing corrosion in steel. The application has already been adopted by the British Gillete Razor Co. for the envelopes in which razor blades are packaged. Monsanto also hopes to get this application accepted for electrical cable wrappings.

French Firm to Erect New Phosphate Units in Brazil

Rio De Janeiro—A French company, Comptoir de Phosphates de l'Afrique du Nord, has reached agreement with a Brazilian group to establish phosphate fertilizer plants in Brazil.

The French firm, which produces phosphates in Morocco, Algeria and Tunisia, will provide technicians and raw materials at the start. The first Brazilian plant is to be built at São Paulo, with capacity of 50,000 tons annually.

Aussies Plan To Make Gamma-Proof Paint

Melbourne—The Australian branch plant of Lewis Berger & Sons Ltd., English paint and pigment firm, plans to produce a paint that will give protection against the deadly gamma rays of the atomic bomb.

The paint, called Leadoid, was developed in England and is said to be under test by civil defense authorities and by the Royal Navy. It consists of colloidal lead suspended in linseed oil

Leadoid can be applied with a spraygun and by allowing the linseed oil to oxidize a solid lead coat can be built up to a thickness of \(\frac{1}{2} \) in.

This lead coat is said to give better protection against gamma irradiation than a solid lead sheet of the same thickness because impurities in rolled lead allow the rays to seep through. The lead coat can be bonded with ease to any surface configuration and to any common metal, to brick and to concrete.

One gallon (imperial) of Leadoid weighs 70 lb. Immediate peacetime uses are foreseen in radiography and in experimental work.

Oil Exploration Started in Ethiopia by Sinelair

Addis Ababa—The Sinclair Petroleum Co. recently began drilling its first oil well in Ethiopia under terms of its 50-year oil exploration monopoly concession.

British Paint Producers Aim at Canadian Market

Ottawa—American paint suppliers in the Canadian market are going to face some stiff competition shortly from the United Kingdom paint manufacturers. It is understood that the British manufacturers are being encouraged by U. K. officials to go after the Canadian business in order to help the dollar situation. John Edwards, parliamentary secretary to the British Board of Trade, told the National Paint Federation meeting in Britain to seek the Canadian market immediately.

Uranium Find in Hartz Range Excites Aussies

Melbourne—Specimens of radioactive minerals with an unusually high uranium content have been received from the Hartz Range about 200 mi. from Alice Springs over the past year, the Australian minister for supply and development, John Armstrong, has revealed.

According to a report received by the government from the director of mines in Alice Springs, the specimens come from a locality known as the Lone Pine, which heretofore has been worked for mica.

The Lone Pine locality was visited by a party of geologists and geophysicists from the Bureau of Mineral Resources and by an inspector of mines in the Northern Territory Administration. The group verified the occurrence of highly radioactive mineral in this deposit.

In a press statement Armstrong said: "Following the recognition of the presence of uranium mineral in the mica occurrence, examination has been extended to other deposits in the Hartz Range area and uranium minerals have been found present in a considerable number of them over a wide area.

"At present these are the two im-

portant features of this discovery: (1) That the uranium minerals occur in the same bodies as the mica; and (2) that the uranium minerals are present over a considerable area. It is too early to size up the economic importance of the discoveries but it is apparent that there is a good prospect of some production of uranium from this locality."

British Columbia Site for Proposed Aluminum Unit

Vancouver—Aluminum Co. of Canada has placed contract for survey work on its projected plant and power development on the northern British Columbia coast.

M. DuBose, vice president, said that much of the preliminary survey will be under the direction of British Columbia Engineering Company Limited, which has an office in Vancouver, B. C. W. J. Huber is vice president and general manager.

This organization, an affiliate of the well-known International Engineering of San Francisco, will outline hydroclectric possibilities of the three locations that have been selected as possible power and plant sites. They are in the Bute Inlet, Dean Channel and Gardner Canal areas.

Among firms already employed 'are Photographic Surveys (Western) Limited, Bayles Bros. Drilling Co. Ltd., McEllhanney & McRae Limited and Queen Charlotte Airlines.

Jack Kendrick, former assistant chief engineer of Public Utilities Commission has been employed as resident engineer on the B. C. survey projects.

Oil From Coal Project May Start in Australia

Sydney—A plant to produce 46,000,000 gal, of high-grade gasoline annually—11.5 percent of Australia's consumption—by liquefaction of coal and cracking of oil shale has been announced in Sydney.

A spokesman of the Standard Oil Co. of Australia Ltd. said that approval of the plan by the Commonwealth Government was being awaited. Government sanction was necessary for the expenditure of \$7 million on plant and equipment.

It is proposed to install a treatment plant at Bacrami, near Muswellbrook, New South Wales. It is said that an American organization has offered a loan of \$7-million provided that the Australian Government furnishes suitable guarantees. A gross saving of \$7,500,000 a year would be effected by the plan through savings on imports

(Continued)

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SEPARATION OF LISTING MAGNETS

MAGNETIC
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Foreign News, cont. . .

and on freight payments. The net annual saving would still exceed \$7 million after payment of royalties and allowance for plant depreciation. The proven coal reserves at the projected plant site would be sufficient to produce \$175 million worth of gasoline at today's valuation.

Buyer's Market Hits Parts of Chemical Industry In Britain but Prices Are Firm

British chemical markets are easier, but prices are holding up well. The control of ethyl and butyl alcohol, acetic acid and acetic anhydride was ended on June 1, and private rationing of potassium permanganate has also been suspended. Most manufacturers can accept orders for prompt delivery, but there has been no excessive accumulation of producers' stocks. The prices of metal compounds have been lowered and there have been price cuts for borax, boric acid, potassium permanganate, acetone and several other solvents in the home market. No wide-spread price fall is anticipated as owing to war and postwar controls British chemical prices have risen only by a fraction of the general advance in world commodity prices. Imperial Chemical Industries Ltd., for instance, claims that while the Board of Trade index of wholesale prices of industrial materials and manufactures in Britain had by last

year risen 133 percent over 1938, the sales index of ICI products sold in Britain rose by 44 percent only.

The position is different in the export market where price levels were determined by shortages without intervention by government agencies, and in this field major price reductions may occur. In the tar products market which normally depends on substantial shipments to North America keen competition is now being met by British suppliers from continental Europe, and home trade buyers are also covering only their immediate requirements. Chemical and alfied exports in April were down to \$27,600,000 from \$37,280,000 in March, a fall by 3½ percent on a working-day basis. While this decline seems small, especially compared with the experience of other British industries, growing sales resistance is being met in various markets, and further (Continued)

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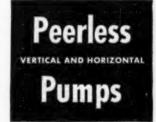
For your next job consider the flexibility and the efficiency of the Peerless vertical turbine pump.

As a deep well pump, for example, a Peerless pump can assure you of an inde-pendent source of clean water from your own well - water that will be of constant temperature, of constant chemical analysis. To cut overhead underground, Peerless turbine pumps embody many exclusive engineering advantages, such as patented Double Bearing-Double Seal bowl construction, all contributing to their extended trouble-free pumping life.

As another example, a Peerless vertical turbine pump utilized as a close-coupled pump, assures you of full turbine pump utility and capacity from short or medium

settings. They're ideally suited for installation over pits, sumps or basins or for pumping water from surface sources. The pumps shown above are indicative of this type of service. You can easily visualize their application to condenser cooling, cooling tower service, etc.

Regardless of your requirements, a versatile Peerless vertical turbine pump will squarely meet your pumping demands. Peerless offers widest capacity range, from 15 to 30,000 gpm against heads to 1000 feet. You can have your choice of oil lubricated or water lubricated types and a choice of power drive, direct-connected electric, right angle gear, V or flat belt or combination drives. Write for individual Bulletins describing the applications of Peerless pumps to these services.



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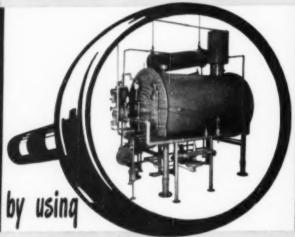
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The two special horizontal type stills shown above were especially designed and built by Barnstead Engineers, for the RCA Television Tube plant at Lancaster, Pa.

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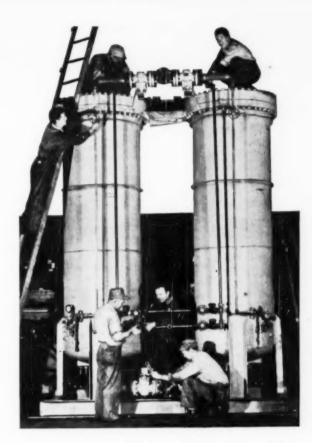
export losses may have to be faced as a result of import restrictions in South African and other markets.

A number of important company meetings were held in Britain's chemical industry last month. The com-mon theme was that 1948 was a year of output and sales records. But deliveries are now catching up with demands. More new plants are coming into operation, and in view of higher productivity and lower absentecism it is expected that these will help to improve efficiency of manufacturing operations. Britain's leading chemical producer last year exported 30 percent of his total output, and similar export achievements are reported by other companies. In view of the general experience during the early part of this year, however, many manufacturers wonder whether the chemical export target of \$36,000,000 a month for the end of 1949 can be reached. In addition to import restrictions, British exporters are now faced with a sterling scarcity in many softcurrency markets, similar to the dollar shortage in the sterling area. It is in these soft currency markets that favorable prices are most easily obtainable. Their partial loss would make the export business less profitable.

Imperial Chemical Industries, Ltd. recorded a total consolidated sales turnover of \$756,000,000 for 1948, compared with \$548,000,000 in 1947. and exports of \$149,600,000 against \$100,800,000. Last year's output by volume was about double that of 1938, while direct exports by value were nearly four times that in 1938. Part of the first stage for extending alkali manufacturing capacity at Northwich came into operation during 1948. It is hoped to complete the first stage of these extensions this year, and a beginning has been made with the second stage, costing some \$52,-000,000, which will come into operation over a period of several years. Chlorine production, through 30 percent higher than in 1947, was 5 percent lower last year than in 1944. and every effort is being made to expand the production in order to meet the rapid increase expected in demand for chlorine from the chemical industry. The first unit of the Gammexane insecticide plant came into operation last year. Through rearrangements in working methods the plant's rated capacity was doubled. The new plant for making Methoxone selective hormone weedkiller started up last year, is working to capacity.

ICI will increase its output of some major general chemicals, like trichloro-(Continued)

July 1949—CHEMICAL ENGINEERING



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Foreign News, cont. . .

ethylene, metallic sodium and sodium evanide. An extensive research program concerning fluorine compounds is being carried out. Extensive mechanization has been undertaken at two limestone quarries, with a resulting output increase per worker of 70 percent. When the mechanization is completed, output should rise ultimately to 500 percent, thus substantially reducing the cost of production. In the salt division the trend towards vacuum salt continues in the interest of fuel economy. Work is proceeding on the extension of vacuum salt capacity by addition of a new plant, It will come into operation before the end of 1949. Developments are also being pressed forward to increase the output of the rock salt mine at Winsford, and research work is being undertaken on new types of salt produced wholly by mechanical means.

In the ICI dvestuffs and pharmacenticals divisions last year production of dvestuffs rose by 25 percent and that of material other than dvestuffs by over 50 percent compared with 1947. The penicillin plant at Trafford Park was converted to the deep culture method. The new polymer plant at Billingham will be producing considerable quantities of polymer this year. New pharmaceutical plants are to be erected at Grangemouth, and a factory at Linlithgow is being equipped for tableting, ampouling and packing pharmacenticals. At the big ICI center at Billingham another Nitro-Chalk fertilizer plant is to be creeted as the first stage of more extensive plans to increase the nitrogenous fertilizer capacity which is considered insufficient to meet probable future demands. In the Nobel division at Ardeer adoption of extensive mechanization, bulk handling and other improvement has resulted in the output per worker being increased by 400 percent, and when these units come into full production, explosives prices are to be reduced.

The ICI paints division last year doubled its direct exports and while competition is likely to be more severe this year, the company expects further progress as a result of considerable research work. Direct exports of plastics were 60 percent higher than in 1947. In view of the easier supply position, the plant at Rawtenstall for the manufacture of Perspex acrylic sheet was closed last year and production concentrated at the more efficient plant at Billingham. Good progress was made with the erection of new plants for phenol-formaldchyde molding powders and Perspex. A pilot plant for Terylene polyester textile

(Continued)

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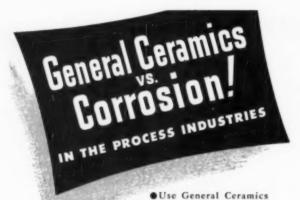
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Our Insulator Division Manufactures Steatites, Percelains, *Single Source of Supply. Titonotes, Ferrites @ 5557 FOREIGN NEWS, cont. . .

fiber was creeted last year, and larger quantities of the fiber will be available late this year. Polyethylene film, recommended as a wrapping and packaging material, is now commercially available in limited quantities.

Major capital issues of chemical producers this month involved \$4,000,-000 for Albright & Wilson Ltd., and \$1,200,000 for Cabot Carbon Ltd., one of the companies erecting carbon black plant in Britain. Albright & Wilson Ltd., who specialize in phosphorus products require more than \$4,000,000 for work now in progress and projected outlays during the next three or four years: \$3,000,000 were spent on capital expenditures last year, and very considerable commitments have been undertaken by the firm for this year. No details have been released about fresh schemes, except that they are mainly connected with phosphorus and its salts. Monsanto Chemicals Ltd., on the other hand, have added to information released earlier that since the original plans for the Newport plant were drawn up two years ago market developments have occurred which have resulted in the need to double, and in some cases nearly treble, production facilities for most of the new products to be made there. Stress is laid on the fact that the Monsanto plants at Ruabon and Newport will help to save dollar imports. They will, it is stated, also provide manufacturing facilities for certain further chemicals which have previously been imported from America. The most important of the new products to be made are a vanadium catalyst for sulphuric acid plants, diphenyl and its derivatives, silicon chemicals, polystyrene and specialty plasticizers for the plastics industryall now imported by Britain from America.

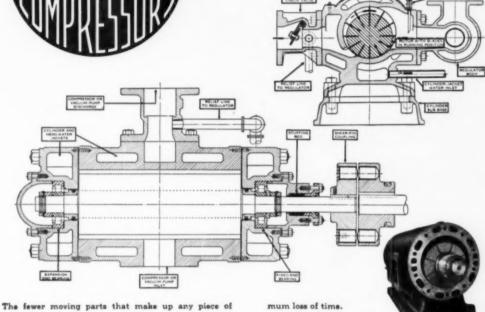
Japs to Boost Ceramics Exports in 1949

Tokyo-Japanese exports of ceramic products are expected to reach a value of \$45,000,000 in 1949, an increase of 125 percent over 1948. Projected values, by class and in comparison with 1948, are:

										1949	1348
										(milli	ons)
Pottery .										520	511.7
Cement											4.0
Glass											3.7
Porcelain	C	n	11	n	el	Ų	e:	11	C	3	1.4
F		- 1								7.7 /	2.1

Considerable quantities of other glass products will be exported in the form of containers, parts and optical glass in cameras and instruments, the (Continued)

Rugged Construction . . . Simplicity of Design ... Minimum of Moving Parts Rotor - Bearings - Blades



equipment, the more continuous service at the lowest operating cost. Fuller Rotary Compressors are an outstanding example of simplicity of design . . . few moving parts: rotor-bearings-blades.

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C-185

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FOREIGN NEWS, cont. . .

value of which cannot be readily estimated. Last year exports of optical glass and instruments amounted to \$1,548,000.

Brazil Opens New Grain Immunization Unit

Rio de Janeiro—A new governmentoperated grain immunization station has been opened in Rio de Janeiro, using a new short wave process as well as the usual chemical process involving toxic gases.

Immunization capacity is 5 million bags per year. The station also has big warehouses and silos for grain storage.

Indian Synthetic Dye Unit Pushed by Government

Calcutta–Establishment of a largescale synthetic dye plant in the Damodar Valley industrial area is being pushed by the Indian government. A preliminary report on the project has been finished by two German experts, and is being laid before a joint board representing the central government, the Bihar and West Bengal provincial governments and the Damodar Valley Corp.

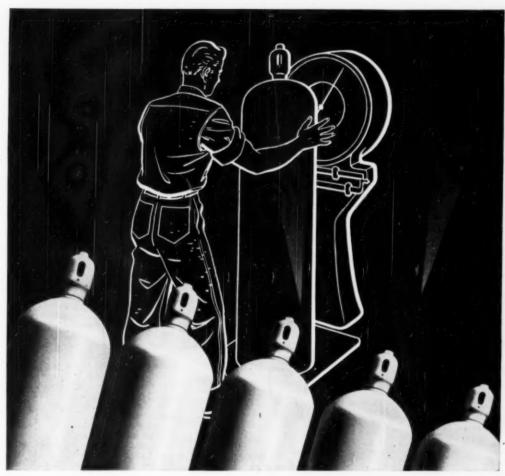
The German plan, it is understood, will not be taken as final. Representatives of the Czech national chemical works and of an Italian firm also are being invited to submit proposals leading to a project survey.

Dow Plans Large Canadian Expansion

Ottawa-Dow Chemical Co. of Canada plans in 1949 to begin a 55 million plant expansion program involving erection of four new units, plus a central research laboratory and extensive additions to the glycol plant completed a year ago, with the major item being a new ethylene production unit to boost production of ethylene glycol anti-freeze at Samia, Ont. Present Dow units at Sarnia represent an investment of \$12.5 million, include a polystyrene plastic molding powder plant in production since 1946, besides the more recent ethylene glycol unit.

India Cuts Back Synthetic Gasoline Plans

Bombay-India's grandiose plan for a coal-based synthetic gasoline plant with an annual capacity of 1,000,000 tons has been considerably scaled down, and the project report from (Continued)



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LIGHTWEIGHT CYLINDERS

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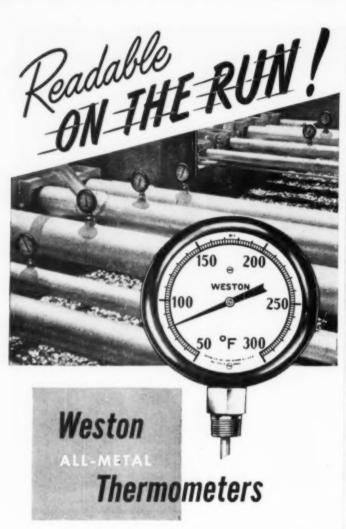
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CHEMICAL ENGINEERING-July 1949

225



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Foreign News, cont. . .

Koppers is expected to be ready before the end of March.

Instead of the giant plant, which was expected to cost roughly \$90 million, the plan now is for one of only 100,000 tons annual capacity. Of this, some 76,000 tons would be aviation gasoline.

India's pressing shortage of dollars and her unfavorable dollar trade balance are believed to be one of the main reasons for the revision.

Cooking Gas From Wood Waste Studied up North

Vancouver - Development of a method of producing domestic gas from wood waste in British Columbia is now being studied jointly by the B. C. Research Council and the B. C. Electric Co., according to the Hon. L. H. Evres, British Columbia Minister of Trade and Industry. Mr. Evres said: Experiments in the gas production project, financed by a \$5,000 contribution from the B. C. Electric and an equal amount provided by the Research Council, have resulted in development of a process for producing a gas with a thermal value of over 450 Btu. per cu.ft. from waste wood.

"A small pilot unit is now under construction," Mr. Eyres said "to obtain basic data for the construction of a large scale commercial plant."

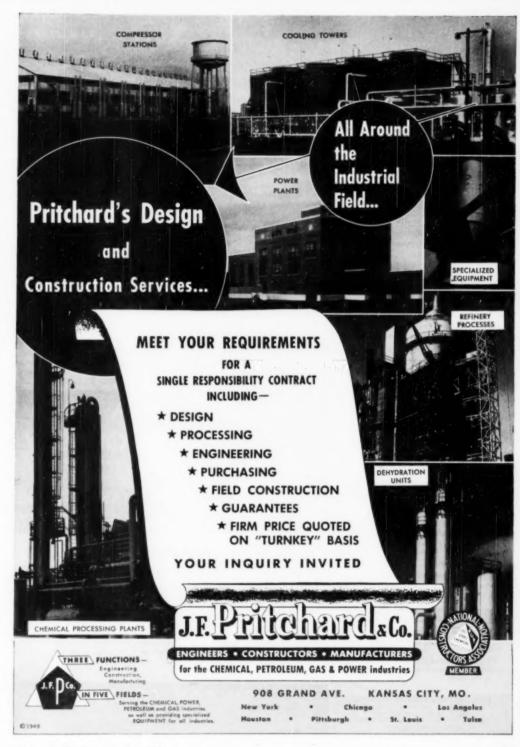
Thermal value given for the woodwaste gas, is the same value generally given for domestic gas manufactured from coal. In either case, the figure is about one-third the heat value of natural gas. This varies from about 1,000 to 1,500 Btu. per cu.ft.

On the University campus, Dr. S. E. Maddigan, director of the research council, declined to estimate probable costs of producing domestic gas from wood waste.

New Ammonium Sulphate Unit for Mysore

Mysore—The Mysore state government has announced an agreement with the Chemical Construction Corp., New York, for the design and construction of a 50,000 metric ton a year ammonium sulphate plant. The factory will be built at Bhadravati. This is the site of a steelworks, a cement factory and a paper mill all owned by the state. It is about 75 miles from the Jog Falls hydroelectric station which will have an installed capacity of 120,000 kw, when completed.

The plant will rank as one of the major fertilizer producers of India, (Continued)





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being as large as the Fertilizers & Chemicals (Travancore) Ltd. plant at

Alwaye, although not in the same class as the 350,000-ton nationally-owned plant at Sindhri which CCC designed and is directing to completion.

German Chemical Industry Is Readjusting To Current Conditions With Rebuilt Units

The chemical industry in western Germany has the punitive phase of the occupation behind it and is now involved in problems of readjustment.

Except for the banning of synthetic oil and rubber production, there is generally a willingness to concede that the final reparations toll, as determined by recent western power agreements, is reasonable and represents no serious impediment to recovery. Out of 75 chemical plants, 32 were removed from the reparations list.

The Germans obviously minimize the necessity of prohibiting synthetic oil and rubber production on the grounds of security and dispute contentions that high production cost factors made the industries uneconomic anyway. They cite two factors which they feel would justify retention on economic grounds: (1) adequate long-term coal reserves and potential for greatly increased output, and (2) a compelling need for cutting foreign exchange requirements wherever possible.

Loss of the byproducts incident to synthetic oil and rubber production also gives rise to complaints. Although some of these byproducts can be gained otherwise, the Germans with characteristic ingenuity had developed a number of byproducts peculiar to the two synthetic processes as well as markets for them. These they would like to continue to exploit, thus making the total processes more economic than otherwise. They had hoped, for example, that despite prohibition on synthetic rubber manufacture, at least a limited capacity for butadiene could

have been retained.

Production of synthetic rubber was halted last June because the price of crude rubber had dropped so low that drawing upon coal and other short supply materials for synthetic production couldn't be justified.

Due to a critical shortage of fatty acids for manufacture of soap and detergents, two Fischer-Fropsch plants in the Ruhr have been operating (Continued)

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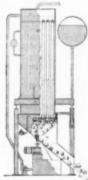
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Tube-Ice Machines and Latent Heater Tank at Burkhardt Brewing In Akron, Ohio. TUBE-ICE MACHINE

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Patent Numbers 2,280,424, 2,239,234, 2,396,308. Other Patents Pending.

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Here, Vogtice is made at night and stored in the water tank and cold water is made by the same machine during the day, thereby utilizing refrigerating capacity aroundthe-clock. The stored ice acts as a flywheel by cooling make-up water admitted into the tank to augment the supply made by the machine to meet the peak wort cooling loads. This system levels out refrigeration load demand with a resulting reduction in demand charges on electrical energy, and the use factor of installed equipment approaches 100%.

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Foreign News, cont. . .

solely for synthesis of hydrocarbon waxes. The final agreement on reparations and prohibited and restricted industries permits operation of these plants until the supply of fats and oils has increased to an adequate level but in no event beyond Dec. 31, 1949. However, Allied officials say the fatty acids supply situation has improved to the extent that operations can be terminated very soon.

Developments in connection with the deconcentration of the I. G. Farben empire remain in status quo. Setting up of "independent units" was virtually completed in the U.S. and French zones many months ago. The British continue to lag in implementing the policy in their zone. British procrastination often is interpreted as being based on the hope that public ownership might take over, although the Social Democrats do not usually mention the chemical industry in connection with their nationalization hopes. Conversely the British position is sometimes ascribed to ICI influence in respect to the deconcen-tration policy. No steps have been taken vet toward selling the stock of the "independent units" in any of the zones.

The fact that intermediates aren't exchanged among the new units on a cost price basis as before hasn't boosted production costs. It has merely forced a redistribution of profits, i.e. formerly, the profits accrued to the central Farben holding unit rather than to the individual plants. Some plants, for example, which made only intermediates and no end products, never showed a profit. The Farben combine served the twofold purpose of evading taxes by having all profits show, at the top and of effectively preventing competition from developing within

Germany.

It is interesting to note the competitive spirit now developing among the new "independent units" which must stand on their own feet to survive. For example, some plants find that after beginning to make certain intermediates themselves the normal supplying units are forced to lower their prices. Then, the buying units often suspend their production as long as they can get a better price from the normal suppliers.

As in the case of most West German industries, the chemical industry is over the hump productionwise. A steady flow of raw materials has been assured under ERP and the mounting proceeds of exports.

The day has come when sales and distribution problems are coming to the fore. Germany's long absence (Continued)



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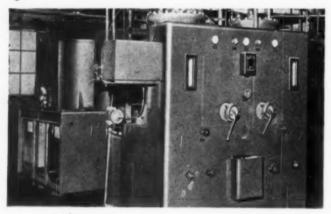
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Foreign News, cont. . .

from world markets and the influx of new competition in the meantime are now matters of concern. The Germans are ever conscious of the loss in world chemical markets suffered after World War I

Currently, however, there are no signs of recession. Rather there is a period of readjustment both to internal conditions and to export trade.

A definite sales resistence has been encountered in solvents. Lack of money is the reason for the cut in domestic demand. The Reichsbahn (German railways) and the Reichpost (German postal system) have had to cut normally large orders. Lack of capital has curtailed industrial and private buying of paints, lacquers and allied products.

In the export field, the German export industries can be expected to continue attaining higher levels in the foreseeable future but this progress must be accompanied by price readjustments, not so much due to high production costs as to lack of postwar pricing experience.

Pharmaceuticals present a particular problem. Lack of settlement of Germany's tangled trademark and patent situation following Allied confisca-tions forces a higher than normal proportion of raw material and intermediate exports rather than the more profitable packaged goods.

Now that the Berlin blockade is lifted, the chemical industries of western Germany should be able to do a considerable business with eastern Germany providing suitable monetary and trading arrangements can be made to obviate the barriers created by having two currencies.

Capital is needed for reconstruction and replacement and for certain expansions. Requirements for new investment in the bi-zone chemical industries for the fiscal year 1949-50 are placed at 250 million marks. It is hoped to secure loans to this extent from Bizonia's new Reconstruction Loan Corp. With savings and other sources of new capital at low ebb, the RLC in turn will depend on release of counterpart funds to help provide needed capital.

Output of sulphuric acid, though increasing, is below demand and will continue to be for some time. It has been proposed that reconstruction and expansion of sulphuric acid capacity be given a priority on capital made available to the chemical industries.

On the other hand, western Germany must consider the future possibility of being able to import sufficient quantities of sulphuric acid from neighboring Belgium at low



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FOREIGN NEWS, cont. . .

prices. Rapidly expanding production of Belgian copper and zine smelters provides a surplus. Belgium also has expanded her superphosphate production to make use of the excess of sulphuric acid, but, of course, has the problem of finding and sustaining markets for the superphosphates. At any rate, she probably could supply Germany with increasing quantities of sulphuric acid.

Further exploitation of western Germany's potash deposits in Lower Saxony is under way, partly to compensate from a falling off of supply from the Soviet zone, but due primarily to the fact that Germany can be a significant potash exporter. This development also will have a claim on new capital available and about \$2 million worth of equipment is sought under ERP.

Western Germany's plastics industry has made relatively good progress since the end of hostilities but requires new and modern equipment.

Among definite new projects planned or in progress in Western Germany are:

1. The I. G. Farben plant at Leverkusen (near Cologne) is erecting facilities for production of film base and for this purpose has taken over the Agfa patents. The Agfa plant is located in the Soviet zone and is entirely controlled by the Soviets.

2. A plant for the manufacture of potassium chlorate, 400 tons capacity per month, is under construction at Lulsdorf in the British zone. It is expected to be completed in about six months.

 The insufficient output of sulphuric acid for production of ammonium sulphate has led already to increase in nitro phosphate production capacity at Hoechst and Ludwigshafen plants of I. G. Farben.

 British Shell Corp. will erect a new refinery at Hamburg, which is destined to play an important role in the expansion of petroleum byproducts.

5. Germany's first plant for the manufacture of penicillin by the deepculture process is under construction at Farbenwerk, Hoechst, with technical know how supplied by Merck & Co. of New Jersey. Under this licensing agreement, first of its kind with German chemical industries since the end of hostilities. Merck technicians have trained Germans in lab control of the process and provided the blueprints and advice for setting up the facilities. Equipment is being made in Germany. The first unit is expected to be producing in December. Ultimate capacity of the new plant will be 400 billion units per month,

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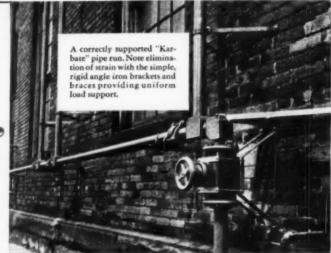


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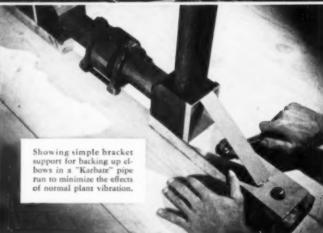
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The Corrosion Forum

EDMOND C. FETTER, Assistant Editor

Fatty Acids versus Construction Materials

Part IV of a four-part symposium in which a representative group of construction materials are evaluated for services involving fatty acids.

Chemical Stoneware F. E. HERSTEIN, General Ceramics & Steatite Co., Keasbey, N. J.

Chemical stoneware is impervious to all fatty acids at all temperatures and pressures at which stoneware is commonly used. Its application is limited in that most fatty acid equipment, reaction kettles, for instance, usually call for higher operating pressures than are normally used with stoneware. Size is also a factor; fatty acid equipment is comparatively large and normally over the \$00-gal, limit generally set for one-piece stoneware vessels. However, stoneware handling equipment such as piping-both bell-andspigot for low pressure and flanged for high pressure up to 100 psi .- and corresponding fittings and valves, are commonly used to transfer fatty acids. Chemical stoneware pumps and exhausters are also used. Smaller vessels, up to 800 gal., are used for storage where economic conditions permit, and stoneware reaction kettles are used in small batch operations up to 350

Nickel and Nickel Alloys W. Z. FRIEND, International Nickel Co., New York, N. Y.

Nickel, Monel, Inconel and Ni-Resist alloys all are used to a considerable extent in the processing of fatty acids. In the Twitchell process of fat splitting where sulphuric acid is employed, Monel commonly is used for solid or lined splitting tanks, steam coils, piping and fittings. Monel tanks and auxiliary equipment also are commonly used in the sulphuric acid washing of fats and fatty acids. The results of a number of plant corrosion tests in the Twitchell splitting of fats are given in Table I. Inconel is sometimes used in the sulphuric acid washing of highest quality stearic acid where it is desired to maintain the best possible color.

One of the most interesting developments in fatty acid production is the use of continuous, countercurrent high temperature splitting of fats with hot water. These processes generally operate under pressures of 600 to 725 psi. and temperatures of 490 to 500 deg. F. Inconel has proved to be one of the most corrosion resistant materials for use in this process and several continuous splitting towers are in

operation made of Inconel-lined or Inconel-clad steel construction.

Corrosion testing in fatty acid stills started a good many years ago when practically all distillation was carried out in batch kettles frequently made of cast iron. The results of a number of plant corrosion tests in batch vacuum stills are given in Table II. Cast iron may be subject to considerable attack especially by graphitization under these operating conditions. Ni-Resist is shown to have much greater resistance to corrosion, varying from 15 to 50 times that of plain cast iron. Because of its reasonably good resistance and its availability in the desired cast shapes, Ni-Resist alloys are being used in some fatty acid distillation equipment, principally for still bodies and pumps.

At the present time it is common practice to distill fatty acids in continuous plate and cap towers. The results of plant corrosion tests in such a (Continued)

Table I-Corrosion Tests in Twitchell

	Corrosion Rates, Mila Per Year					
Test Location, Duration	Inconel	Nickel	Monel			
In liquid, 83 days In liquid, 65 days At liquid level, 38 days At liquid level, 6 days. At liquid level, 61 days. In liquid, 61 days In liquid, 61 days At liquid level, 61 days	5.0 4.9 2.7 18 4.2 3.0 8.5 <0.1	13 18 8.7 37 15 9.6 9.2 1.8	2.5 2.6 3.1 8.9 2.7 0.7			
In liquid, 61 days	< 0.1	1.5	0.4			

¹Also in this test: Ni-Resist, 15 mils per year; plain cast iron, 71 mils per year. ²These last two tests: in storage of acids from Twitchell process, 160-180 deg. F. All other tests: in mixture of fats or olfs, 1-1½ percent sulphuric acid and Twitchell reagent, up to boiling.

Table III-Corrosion Tests in High Vacuum Fractionating Column During Distillation of Refined Tall Oil

	Corrosion Rates, Mi Per Year Test 1 Test 2	T.
Monel	4 8	
Nickel	3 15	
Inconel	4 10	
Mild steel	Note 1 Note 1	
Ni-Resist (Type 1)	71 30	
Cast iron	Note 3 1304	

Test 1: 195 days, in vapor at top of column, 470-510 deg. F. Test 2: 195 days, in liquid at bettom of column, 500-550 deg. F. **Completely corroded away; specimens originally 0.052 in thick. **Graphitized; some graphite not removed in cleaning. **Acompletely corroded away; specimens originally 0.25 in thick. **One specimen originally 0.25 in thick. **One specimen 0.25 in thick completely corroded away.

Table II-Corrosion Tests in Fatty Acid Vacuum Stills

	Corrosion Rates, Mils Per Year				
	Test 1, 10 Days	Test 2. 21 Days	Test 3, 22 Days	Test 4. 51 Days	Test 5, 77 Days
Inconel, in vapors in liquid	3.7	0.8	1.6	1.8	···· o.1
Nickel, in vapors.	32	3.3	9.2	12	****
Monel, in vapors	37	2.5	14	10	2177
in liquid Mild steel, in yapors	36	3.9	26	Note 1	12
in liquid Ni-Resist, in vapors	** 80	140	27.54	**12	0.112
in liquid	120	15	61	*1144	18
Plain cast iron, in vapors	1,600	790	1 200	430	370

All tests in mixed fatty acids, 400-500 deg. F. ¹⁸Becimens completely destroyed before end of test; rates calculated to be 120 mils per year min, assuming specimen destroyed in exactly the duration of test. ⁵Plain cast iron specimens showed severe graphitic corrosion.



Adsorption . . . A Thumb Nail Sketch

A window or mirror will hold, quite tenaciously, a thin film of moisture, grease, or oil. This is a property possessed by all surfaces. It is caused by a sort of "companionship hunger" of the surface molecules. Within the glass, all molecules are chummily holding hands. The surface molecules have some free hands and their holding power is the force commonly called adsorption.

The film held on an ordinary window is small. But the amount of material adsorbed would be sizeable on a glass of fifty acres—just about the surface you'll find in a pound of activated carbon occupying only 50 to 60 cc. of space! That's because this is practically all internal surface area—the walls of tiny capillaries. When carbon is removed from liquids by filtration, the impurities adsorbed go along.

Next month we'll discuss in a general way the different types of activated carbon and their fields of use.



DARCO CORPORATION

60 East 42nd St., New York 17, N.Y.

CORROSION FORUM, cont. . .

tower during distillation of tallow fatty acids are given in Table III. Inconel is used for the construction of these towers, plates, caps and associated tubular preheaters and piping. Monel is sometimes used for bubble caps and piping.

INCONEL FOR TALL OIL

Tall oil derived from the splitting of soaps formed in sulphate pulp mill black liquors is being used to some extent as a source of fatty acids. Tall oil is composed of approximately 30 to 45 percent fatty acids (mainly oleic, linoleic and linoic), 50 to 55 percent resin acids (mainly abietic) and 8 to 10 percent of unsaponifiable materials mainly sterols). One method for separating refined tall oil into its principal constituents is by fractional distillation under vacuum. The results of plant corrosion tests during continuous distillation of tall oil are given in Table III. Inconel is giving good performance in tall oil stills, heaters and associated equipment. Monel is used in the sulphuric acid splitting of tall oil soaps.

Inconel-clad steel and nickel-clad steel are used for storage of refined fatty acids.

Note: Further information can be obtained from Inco's Technical Bulletin T-18.—Editor.

Durimet-20

WALTER A. LUCE, The Duriron Co., Dayton, Obio

Durimet-20 has wide application for handling 100 percent fatty acids and for fatty acid solutions containing other corrosives such as sulphuric acid. Although the conventional stainless steels, 18-8-S and 18-8-S-Mo are extensively applied throughout the chemical industry for handling fatty acids at elevated temperatures, the crosion-corrosion conditions encountered in pumps and valves favor the use of a higher alloyed stainless steel such as Durimet-20. In other instances where high purity of the prod-uct is paramount, Durimet-20 equipment is being successfully applied. It is often selected in preference to the less alloved stainless steels to avoid coloration of the fatty acid from contamination although these other alloys show "acceptable" corrosion rates. Corrosion tests conducted on Durimet-20 indicate that it can be successfully applied to handle fatty acids at temperatures slightly in excess of 500 deg. F.

Durimet-20 is an austenitic stainless steel with a nominal chemical compo-(Continued)



A Cambridge Drive Chain Belt gives fast, economical and safe handling of slab rubber through vulcanizing and cutting.

Combining motion and processing, Cambridge Woven Wire Conveyor Belts offer these solutions to materials handling problems.

Fast continuous production—improved, more uniform products—work area savings—reduced accidents from manual handling—PLUS reduced handling costs by freeing manual labor for other jobs. Cambridge belts can be fabricated from any metal or alloy—to the mesh or weave that suits your requirements best.

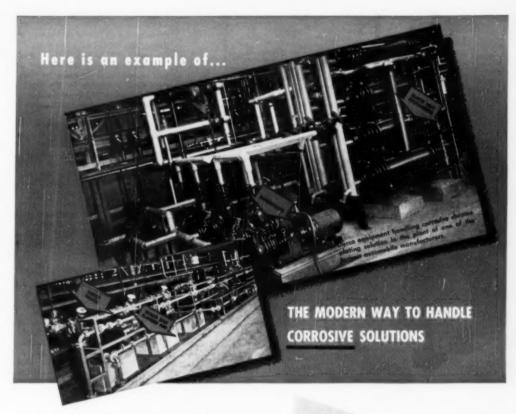
PREE BOOK! "Woven Wire Conveyor Belts for Industrial Applications." 35 pages, illustrated. Describes Cambridge Belt construction and use. Write taday for your free copy... or cell the Cam-



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More and more Durco equipment is being used to pump, carry, heat and control chemical corrosives. Two of the many important reasons for this are:

- 1 LONG LIFE—All Durco equipment is constructed of special alloys for a complete range of corrosive services.
- 2 UNINTERRUPTED SERVICE—Durco equipment is engineered for continuous, trouble-free operation in the handling of corrosives.

The first aim of DURCO engineering is to provide design features which assure maximum life and minimum maintenance. When handling corrosives this is most important. Thirty-seven years of experience in this specialized type of design are back of Durco equipment.

For further information on Durco corrosionresistant equipment, simply use the coupon.

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high ratios ?



DE LAVAL DOUBLE REDUCTION WORM GEARS

De Laval double reduction speed reducers, consisting of combinations of double worm gear reductions, or helical and worm gear reductions, are available with overall ratios up to approximately 8000 to 1. De Laval single reduction worm gear speed reducers are available in ratios up to 90 to 1. If high ratios are your requirement, worm gear speed reducers are the answer—particularly if space is limited and reliability is important. A De Laval representative will help you pick the right size and type.

This double reduction De Laval Worm Gear Speed Reducer is available in many standard ratio combinations, with horizontal or vertical output shafts and is but one of 93 sizes and types of standard De Laval Worm Gear Speed Reducers.

WG-14

DE LAVAL

Worm Gear Division: De Laval Steam Turbine Co., Trenton 2, N. J.

TURBINES - HELICAL GEARS - WORM GEAR SPEED REDUCERS - CENTRIFUGAL FUMPS CENTRIFUGAL BLOWERS AND COMPRESSORS - IMO OIL PUMPS sition in the cast form as follows: 29 percent Ni, 20 Cr, 1.75 Mo min., 3.5 Cu. min., 1.0 Si and 0.07 C max. Experience indicates that an alloy of this composition exhibits at least equivalent resistance to the regular stainless steels in highly oxidizing services such as nitric acid and is superior in the others.

Durimet-20 is available in both the cast and wrought forms. The wrought alloy is also available from the Carpenter Steel Co. under the name Carpenter-20, and at present can be obtained in the form of wire, rods, bars, strip and welded pipe and tubing. Durimet-20 welding rod can also be supplied. Chemical equipment available in the cast form includes centrifugal pumps, valves, fans, ejectors, jets and mixing nozzles. Rough castings can be obtained for the manufacture of other special equipment.

WHERE DURINET IS USED

Typical service applications are given below which exemplify the services for which Durimet-20 is used in the chemical and allied industries.

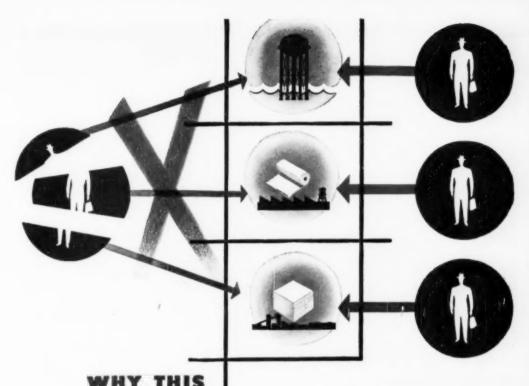
1. A large soap manufacturer almost exclusively uses valves with the Durimet-20 composition for handling stearic, oleic and palmitic acids. Although tests indicated that the 18-8-S-Mo alloy might also be satisfactory, the Durimet-20 analysis was selected as an added safeguard against erosion-corrosion and for the sake of extreme purity.

2. Another soap manufacturer originally purchased 18-8-S-Mo pumps for handling fatty acids at various temperatures. However, the subsequent replacement parts which were purchased in Durimet-20 are giving better service life. Durimet-20 pumps and valves are also being applied for handling sulphuric acid used in the manufacture of soap.

 A Durimet transfer pump gave over seven years of successful service on handling 100 percent fatty acids at 212 deg. F. before replacement parts were ordered.

4. Durimet-20 steam jets are giving long service in a large chemical plant for heating a batch tank where stearic acid is being reacted to form fatty acid salts such as zine and aluminum stearates. Durimet-20 and Duriron equipment are also satisfactorily handling the stearic acid prior to the reaction.

5. Numerous other services are on record where Durimet equipment is handling fatty acid solutions. This alloy is also applied to handle caustic, sulphuric acid and glycerine which are handled in the manufacture of soap and other detergents. —End



TECHNICAL SERVICE DIFFERENT...

Solvay Technical Service is organized on an "Industry-Wise" system . . . with Technical Service men who have spent their entire careers specializing in individual industries. The result-each man knows his industry and its problems more intimately; he can offer sound advice and practical help.

Our textile specialist is thoroughly familiar with all chemicals utilized in textile manufacturing processes. But though many of the same chemicals are used in the paper, water or other industries, our textile specialist is not called in on their problems ... because his entire experience is concentrated on textile operations. The paper, water and other industries are covered by SOLVAY TECHNICAL SERVICE men who are experts in their respective fields.

When you come across a productionsnagging technical situation involving alkalies or associated products in your plants ... why not call SOLVAY Industry-Wise TECHNICAL SERVICE for help? The strictest confidence is assured. And remember-SOLVAY is backed by sixtyseven years of technical experience!



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The photo reproduced above shows particles of Dicalite Speedflow magnified 6,000 times by the electron microscope. It illustrates more graphically than many words the reason Dicalite filteraids give brilliant clarity at high flowrates. The "needle-like", elongated, or otherwise irregularlyshaped particles assume a "straw-pile" arrangement in the filter cake. Millions of microscopically fine interstices are formed which trap the smallest solids, yet allow liquor flow at high rates. Besides Dicalite Speedflow there are other grades affording a wide range of performance so that you can regulate the operation of your filter station to meet production demands, or maintain desired clarity and output with liquors of varying filterability. Complete data gladly sent on request.

DICALITE DIVISION, GREAT LAKES CARBON CORPORATION



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Names in the News



MAN OF THE MONTH

G. W. Russell

Here's Cyanamid's genial George Russell. Ex-Lieutenant Colonel Russell is the new president of the Chemical Market Research Association.

Young—he'll just be turning 34 as you read this on July 17—George W. Russell was born in New Jersey. He's a 1936 graduate of the chemical department of Princeton. From the University he went with Du Pont for five years in research, pilot plant operation and new product sales development.

Lloyd H. Brown, formerly associated with A. J. Norton, chemical consultant in Scattle, has joined the chemicals department of the Quaker Oats Co., Chicago. His duties will involve use studies on furfural and derivatives.

Edwin C. Jahn, professor of forest chemistry at the N. Y. State College of Forestry, Syracuse, has been appointed to the newly created position of director of research at the college.



C. Jahn E. S. B

Everett S. Bissell has been appointed vice president in charge of sales, research laboratories, chemical engiIn 1941 he was 26 years old. After entering the Army, he was executive officer of two of the major branches of the Manhattan Project. During the summer of 1946 he served on the technical staff of the United States Representative to the United Nations Atomic Energy Commission.

George joined the American Cyanamid Co. in November 1946 after being re leased from the Army. He was assigned first as assistant to the manager of the Industrial Chemicals Division and later was appointed assistant to the vice president in charge of research and development for the company.

His work with Cyanamid since 1946 has been concerned with market research and product development matters. Early in 1949 he was appointed manager of Cyanamid's newly created new product development department. In May of this year George was promoted to assistant sales manager of Cyanamid's Industrial Chemicals Division, the position he now holds.

In 1938 he married Edith T. Munroe in Teaneck, N. J., and now has a six-year-old daughter. He is currently a Teaneck resident.

His hobbies are non-violent sports: horseback riding, tennis, swimming and boating. He claims to have given up golf after graduation when his scores rose to the higher brackets.

neering and process engineering for the Patterson Foundry & Machine Co., East Liverpool, Ohio.

W. A. Schmidt, of the Central Research Laboratory staff of General Aniline & Film Corp., has been named research and development coordinator for the company's Ansco and Ozalid divisions.

Raymond E. Kirk, head of the department of chemistry and dean of the graduate school of the Polytechnic Institute of Brooklyn, has been elected president of the Metropolitan Long Island group of the American Chemical Society's New York Section. Professor Kirk succeeded Robert B. Killingsworth of the Socony-Vacuum Oil Co., Brooklyn.

Calvin A. Campbell, Donald Williams and Ralph M. Hunter are new members of the board of directors of Dow Chemical of Canada, Etd. Concurrently, Mr. Williams was elected a vice president of the Canadian company and Mr. Campbell was elected secretary to replace Leland I. Doan who resigned the post in view of his recent election to the presidency of the parent company.

Lauren B. Hitchcock has resigned as vice president of Quaker Oats Co. to accept a position as director of research and development of National Dairy Products Corp. and president, National Dairy Research Laboratories, Inc. in New York. Homer R. Duffey has been appointed general manager, chemicals department, at Quaker Oats.



L. B. Hitchcock

J. C. Warner

J. C. Warner, dean of graduate studies and head of the chemistry department at Carnegie Institute of Technology, has been named president-elect to succeed Robert E. Dougherty. Dr. Dougherty will retice at Carnegie's president next year.

Ernest H. Volwiler, executive vice president of Abbott Laboratories, was awarded an honorary degree of doctor of science by Northwestern University on June 13.

Marvin J. Udy is now giving half his time to Vanadium Corp. of America which is developing some of his processes for chromium and ferroalloys. He continues as consulting engineer for New Jersey Zinc Co., and for Fabrica Nacional De Carburo Y Metallurgia of Chile.

Joel H. Hildebrand, dean of the college of letters and sciences and chairman of the department of chemistry in the University of California, presented the 1949 Remsen Memorial Lecture sponsored by the Maryland Section of the American Chemical Society, May 27.

John B. Cloke has been appointed head of the department of chem-(Continued)



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The Whitlock Type KR Kettle Type Reboiler has now been designed to meet the need of industry for a standard, low-cost vaporiser adapted to multi-purpose process require-ments. Using propane as an example, standard sizes provide vaporizing rates ranging from approximately 1,000 to 12,000 lbs. per hour. The Type KR Reboiler is of allsteel construction and is ideal for any service where conditions are non-corrosive to steel. The overall design results in standard reboilers answering the requirements of a wide range of individual operating conditions. Maximum heat flux, boiling rates, fluid velocities, vapor disengagements—these and other factors are considered as they relate to a given installation, and represent the background for each Whitlock recommendation.

MECHANICAL AND PHYSICAL DESIGN

The Type KR Reboiler is of a U-tube design which has proved so satisfactory for steam-tube service. With the eccentric contical port head, the tube bundle is placed lew in the shell, thus minimizing the shell size. While we have discussed only the standard all-steel construction, corrosion-resistant materials may be utilized where process fluids make it advisable. Whitlock Bulletin No. 130, issued recently, gives a detailed description of these standardised reboilers. Why not send for your free copy?



NAMES IN THE NEWS, COUR. . .

istry at Rensselaer Polytechnic Institute, Troy, N. Y.

Karl T. Compton has been elected a director of the McGraw-Hill Publishing Co. Dr. Compton is chairman of the research and development board of the National Military Establishment and chairman of the corporation of the Massachusetts Institute of Technology. Until recently, he was president of M.I.T.





K. T. Compton

L. T. Work

Lincoln T. Work, who has been with Metal & Thermit Corp. for the last nine years as director of research and development, has left that organization to become associated with Alan R. Lukens at Powdered Material Research Laboratories, Cambridge, Mass. Dr. Work will specialize on abrasives, refractories, metal powders and dusts.

Winston D. Walters, professor of chemistry at the University of Rochester, has been elected chairman of the Rochester Section of the American Chemical Society. He succeeds Maurice L. Huggins of the research laboratory of the Eastman Kodak Co.

Frank R. Mayo of the United States Rubber Co., Passaic, N. J., has been elected chairman of the North Jersey Section of the American Chemical Society. Dr. Mayo took office July 1, succeeding H. F. Wakefield of the Bakelite Corp.

William E. O'Brien, until recently project engineer on the atomic energy installation at Brookhaven, L. I., has joined Fraser, Brace & Co., New York.

Willis T. Harbeson has been appointed to the staff of the Battelle Institute, Columbus, Ohio, where he will be engaged in research in fuels technology.

Gustav Egloff of Universal Oil Products Co. was awarded honorary membership in the American Institute of Chemists at a meeting in Chicago on June 3. Dr. Egloff has also been elected president of the Western Society of Engineers, Chicago.

Wilber O. Teeters has joined the M. W. Kellogg Co. at the Jersey City laboratory of its petroleum and chemical research department. He is associated with product development activities in the petroleum and chemical fields.

Harry M. Mitchell has been named chief engineer of Jefferson Chemical Co., Inc., replacing G. R. Wick, who has been made assistant to the production manager.

A. A. Blaess has joined Minnesota Mining & Manufacturing Co. and will handle market development of fabricated products. J. M. Rogers is now responsible for marketing 3M's fluorocarbon compounds.

Raymond C. Firestone, vice president of the Firestone Tire and Rubber Co., is now in charge of research and development, a newly created executive post.

Sidney Sussman has become associated with the Water Service Laboratories, Inc., of New York, as chief chemist. Dr. Sussman was chief chemist for the Liquid Conditioning Corp.





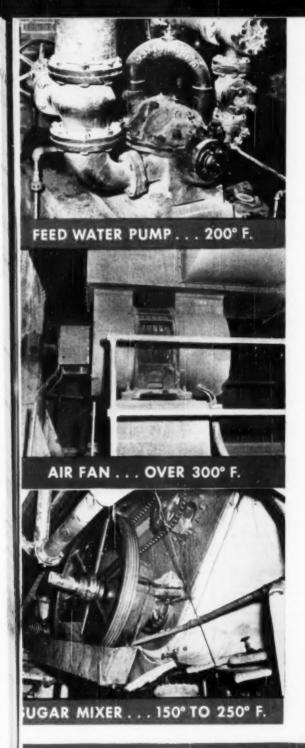
S. Sussman

G. W. Hooker

George W. Hooker, who has wide experience in chemical research, process engineering, and plant operation, has joined Koppers Co., Inc., as chief engineer of the chemical division. Mr. Hooker had been associated with the Kellex Corp. as project manager on an extensive engineering assignment in the field of atomic energy.

Albert B. Agnew has been named vice president in charge of operations of all plants of the Laclede-Christy Co. and subsidiary companies.

William K. Noyce, associate professor of chemistry, has been elected chairman of the University of Arkansas Section of the American Chemical Society. He succeeds W. W. Gri-(Continued)



Now, one grease withstands <u>both</u> heat and water

Bearing Lubrication posed a continual problem for a midwest sugar-refining company.

The ball bearings in feed-water pumps operate around 200° F. and, in addition, are exposed to the washing action of water. The ball bearings in air fans have operating temperatures over 300° F. The shaft bushings in a sugar mixer operate at around 200° F. and are subjected to continuous attack by the sugar-water mixture.

These conditions proved too severe for conventional greases. Bearings failed frequently. Maintenance costs were high. A Standard Oil Lubrication Engineer tackled the problem. He suggested the use of Stanolith Grease—a lithium soap product with the unusual ability to withstand both high temperatures and the washing action of water.

The switch to Stanolith has eliminated bearing maintenance for the feed-water pumps. Bearings in the air fans have been kept in almost continuous operation. On the most difficult job of all, Stanolith has prevented bearing wear and seizure troubles in the sugar mixer. Costly shutdowns and repairs of the mixer have been eliminated.

Where both heat and water interfere with lubrication of your equipment, try Stanolith Grease. A Standard Oil Lubrication Engineer will be glad to give you more information about this versatile product.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.



STANDARD OIL COMPANY (INDIANA)



Greater Service to Fork-Truck Users

Greater Opportunities for Men Who Sell Them —

Clark Dealer Plan achieves Both

WITH sales of its fork-lift trucks and industrial towing tractors exceeding all expectations, and with its position of

production and engineering leadership firmly rooted in rich, productive soil, Clark Equipment Company, in its 30th year as a builder of materials-handling machines, has found it desirable to establish a nation-wide organization of independent franchised dealers as exclusive distributors of the products of its Industrial Truck Division.

HIS is indeed a far cry from 1939 when the entire output of the Industrial Truck Division was sold with ease by a handful of men!



TODAY'S volume that of 1939; and the Company's staturefinancial and engineering-is more

than twenty times as great as in 1939. A considerable number of the '39 machines are in daily service, and many older machines are in regular operation after 20 and 25 years. The conviction is natural that 30 years hence many '49 machines will still be "on the job" alongside the new output of 1979. There will be no "orphans" bearing the name "Clark."

O KEEP PACE with increasing demands, and to deliver the broad and competent service which Industry expects from Clark, the Company has chosen this plan of selling through independent dealers as a sound and logical evolution. Until the middle of 1948, approximately one-third of Clark's Industrial Truck Division representatives were on an independent dealer basis. It is expected that by the end of 1949 the nation-wide dealer organization will be complete.

HEADING up the dealerticipating in them are key men of Clark's erstwhile factory-branch sales offices -factory-trained men, tested and proved as capable materials-handling counselors. These men share with Clark management the conviction that they can deliver, under the new plan, a broader and more valuable service to their customers and to all users of mechanized materialshandling; that they face broader, deeper vistas of opportunities which ambitious men so earnestly desire-opportunities for independence, for building greater earnings by their own efforts, for achieving prestige and leadership in their communities.



ANOTHER influence the plan is the fact that Clark management historically has been engi-

neers and manufacturers. By decentralizing marketing activities, Clark can intensify its emphasis on development of better materials-handling machines and methods-to the end that Clark products shall achieve even higher excellence at lower cost, shall become still more valuable to industrial users and to the dealers who serve them.

HROUGH your Clark dealer, all the advantages of Clark engineering.integrated production and matchless experience are quickly available to you. He is fully qualified to make an unbiased appraisal of your materialshandling operations, and to recommend the type of machine that will serve you most efficiently at lowest cost. It's "good business" to CONSULT CLARK.

CLARK EQUIPMENT COMPANY

INDUSTRIAL TRUCK DIVISION

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SAN DIEGO ROBERT H. BRAUN COMPANY 3872 FIFTH AVENUE STOCKTON GLEN L. CODMAN COMPANY 409 BELDING BUILDING

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LOWA: DAVENPORT BIG RIVER EQUIPMENT CO. 1344 WEST THIRD STREET DES MOINES *BIG RIVER EQUIPMENT CO. 914 GRAND AVENUE, ROOM 255

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MARYLAND: HALTINGET FALLSWAY SPRING & EQUIPMENT CO. CORNER FALLSWAY & LEXINGTON

MASSACHUSETTS: BOSTON (MALDEN 48) BRODIE INDUSTRIAL TRUCKS, INC. 50 COMMERCIAL STREET, MALDEN 48

CLARK EQUIPMENT COMPANY INDUSTRIAL TRUCK DIV. PLANT

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NAMES IN THE NEWS, COURT. . .

gorieff, director of the Institute of Science and Technology of the university.

Howard P. Mansfield, of the Grasselli chemicals department of the Du Pont company, has retired after 44 years continuous service.

David H. Chadwick has been promoted to group leader in the research department of Monsanto Chemical Co.'s phosphate division at Anniston, Ala.

Robert K. Finn, who will receive his Ph.D. in chemical engineering at the University of Minnesota next month, has been appointed assistant professor of chemical engineering at the University of Illinois. He will be in charge of the bio-engineering development.

C. R. Holt has been named technical service manager and H. H. Irvin is chief chemist of Marbon Corp., Gary, Ind.

Donald L. McCollum has been appointed plant manager of the synthetic rubber plant operated by United States Rubber Co. in Naugatuck, Conn. Mr. McCollum, a native of Naugatuck, was graduated in chemical engineering at Purdue University.

Lorin B. Sebrell has resigned as director of research and chemical products development at Goodyear Tire & Rubber Co.

John Hufnagel, chemical engineer, has been appointed manager of the Kaskade Tray division of the Koch Engineering Co., Wichita, Kan. Mr. Hufnagel was formerly with Hydrocarbon Research, New York.

Hillary Robinette, Jr., research director of Amalgamated Chemical Corp., Philadelphia, textile chemical firm, has been elected chairman of the Philadelphia chapter, American Institute of Chemists. He succeeds Helmuth Pfluger of Merck & Co., Rahway, N. J.

Lowell B. Kilgore has been appointed acting chief of the chemicals divi-sion, U. S. Department of Commerce to succeed Frederic Arden who has resigned to return to private industry.

C. F. Smith, superintendent of the light oils division of the Whiting, Ind., refinery of Standard Oil Co. (Continued)

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- 13 Resistance to Abration and Wear



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EVERLASTING FASTENINGS

NAMES IN THE NEWS, COUR. . .

(Indiana), has been promoted to assistant general superintendent of the refinery. He succeeds Roy J. Diwoky, who has become executive assistant to the president and a director of Pan American Petroleum Corp., a Standard subsidiary with headquarters at New Orleans, La. C. E. Evans, assistant superintendent of the light oils division at the Whiting refinery, succeeds Mr. Smith, and Ford H. Blunck, general foreman of the pressure stills department in the light oils division at Whiting, succeeds Mr. Evans.

Kurt E. Rosinger, formerly of Houston, Tex., has been appointed assistant chief of the chemical branch, Office of International Trade, U. S. Department of Commerce.





R. Weigel

F. M. Anabl

Rothe Weigel, former vice president of Victor Chemical Works, Chicago, Ill., has been appointed president of the company. Francis M. Anable, former general production manager, is now a vice president.

Ambrose W. Staudt, manager of the Du Pont company's nylon technical service section for the last four years, has been appointed manager of the market research section of the company's trade analysis division. Staudt will be succeeded by George H. Braniff, who has been assistant manager of the nylon technical service section for the last year.

William H. Abernethy, has been named special representative of the chemical division, the Goodyear Tire & Rubber Co. and will headquarter at Birmingham, Ala.

George T. Felbeck, vice president of Carbide and Carbon Chemicals Corp., received the eighth annual John Wesley Hyatt Award of the Society of Plastics Industries in Chicago May 26.

George W. Sears, professor of chemistry at the University of Nevada, has retired. He began his career at Nevada in 1917. He became head (Continued)

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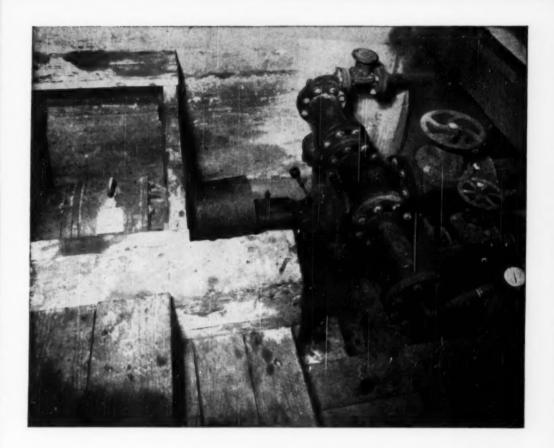
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- Names in the news, cont... of the department in 1926. He is now engaged in research for the Navy and plans to continue this after retirement.
- T. G. Hughes has been elected executive vice president of Oronite Chemical Co., San Francisco. B. W. Anthony has been made a director and secretary-treasurer.
- Edward A. Haagensen has joined the Dicalite division of Great Lakes Carbon Corp., Los Angeles. He will specialize in chemical engineering work with the sugar and allied industries.
- Earl B. Working, formerly professor of chemistry at Kansas State College, has joined the research staff of Truesdail Laboratories, Inc., Los Angeles.
- R. L. Albrook, research chemist on the staff of the Washington State College engineering experiment station, has been appointed director of industrial research at Washington State Institute of Technology, Pullman.
- Gordon P. Larson has been named director of the Los Angeles County Air Pollution Control District succeeding Louis C. McCabe who resigned to take a research position with the U. S. Bureau of Mines in Washington.
- Joseph E. Waltz, who has been associated with nylon research since his employment by the Du Pont company in June 1941, has been promoted to the position of a research supervisor.
- Russell L. Bauer has been appointed manager of the process section of the general engineering department of Monsanto Chemical Co., St. Louis.
- Richard L. Ryan is now chief of the laboratory division of the Alcohol Tax Unit, Bureau of Internal Revenue, succeeding W. V. Linder who died last month.
- Walter Pascoe, a recent graduate of Pennsylvania State College, has accepted a position in the research laboratory at the Atlas Mineral Products Co., Mertztown, Pa.
- John Van Brunt, vice president of Combustion Engineering Co., and engineering consultant for Combustion Engineering-Superheater, Inc., (Continued)



... and they specify LABOUR

Although it is a non-priming pump, this LaBour Type Q is operating successfully with a nine foot suction lift. The Q was chosen for its known vapor capacity, since the liquid handled—waste from a plating plant—is gaseous. It is also highly corrosive, as it contains chromic, hydrochloric, and sulphuric acids plus

cyanide, with varying amounts of free CO₂ gas.

This pump has been in service 24 hours per day for about two years. It was recently taken down for inspection, and no sign of corrosion was found either on the pump casing or the impeller.

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LAPP INSULATOR CO., INC., PROCESS EQUIPMENT DIVISION, 104 MAPLE STREET, LERDY, N. Y.

NAMES IN THE NEWS, CORT. . .

received an honorary degree of doctor of engineering from Stevens Institute of Technology last month.

- Edward R. Weidlein, director of Mellon Institute, received an honorary degree of doctor of engineering from Reusselaer Polytechnic Institute, on June 10. On June 2 Dr. Weidlein was presented with an honorary membership in the American Institute of Chemists.
- Harold R. Murdock, head of the pulp and paper industry, forestry division, SCAP, has resigned from General MacArthur's staff in Japan, to join Roberts and Co. Associates, Atlanta. Mr. Murdock will be in charge of the company's new paper and chemical department.





H. R. Murdock

J. H. Schaefer

- John H. Schaefer, Ethyl Corp. vice president in charge of manufacturing, has been elected president of the Industrial Research Institute. Mr. Schaefer has been assoicated with Ethyl Corp. for 23 years and has been a vice president of the company since 1943. He lives in Baton Rouge, La.
- John V. Freeman, director of U. S. Steel's Coal Chemicals Sales Division, has just returned from a twomonth vacation in Europe.
- F. L. Byrom, former assistant to the general manager, has been appointed assistant manager of the tar production department of Koppers Co., Pittsburgh.
- J. M. Fox, engineering department, has been appointed safety engineer for Sharp & Dohme, Inc., Philadelphia. He succeeds W. S. Stepp who has resigned from the company to organize a private consulting farm.
- Leland M. Jones, a member of the Du Pont company's rayon organization for 16 years, has been appointed plant manager of the Orlon aerylic fiber plant which is now under construction at Camden, S. C. He will (Continued)

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No welds and no seams! All NIBCOLOY fittings—tees, elbows, couplings, return bends—are cold formed from a single tube by the same exclusive patented process. They are available from 1/4" O.D. to 4" O.D. in Monel, Inconel, Nickel and Stainless Steel 304—347—316. They make possible quality installations with economical light weight tubes, and are especially adaptable where corrosion and turbulence are problems.

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See Western's catalog pages in the current issues of Chemical Engineering Catalog, Refinery Catalog, and Thomas Register.



Names in the News, cont . . . establish headquarters there in the fall. Manufacturing operations are scheduled to begin the latter part of 1950.

Gordon Urquhart has been appointed to the consulting staff of the Maneely Chemical Co., Wheatland, Pa. A member of the American Institute of Chemical Engineers, Mr. Urquhart is on the chemical staff of America La France Foamite Co. He is a director of American Fomon Co. and other companies.

Richard J. Servis has been appointed head of a newly organized manufacturing department at the Rensselaer, N. Y. plant of Winthrop-Stearns Inc. William J. Boegly has been appointed director of the pharmaceutical manufacturing department.

Howard E. Fritz, vice president-research of the B. F. Goodrich Co., has been named 1949 winner of the Lamme Medal of the Ohio State University. The gold medal and a bronze replica were presented in Columbus, June 10.

OBITUARIES

Joseph J. Moosmann, 65, recently retired assistant general manager of the fabrics and finishes department of E. I. du Pont de Nemours & Co., died suddenly in Wilmington, May 18.

Arthur Evan Boss, manager of pigment sales of the Columbia Chemical division, Pittsburgh Plate Glass Co., died in Barberton, Ohio, May 18.

William V. Linder, 66, for many years chief of the laboratory division of the Alcohol Tax Unit, Bureau of Internal Revenue, died after a brief illness on May 29.

Irving Howland Taylor, 60, president of the Merchants Chemical Co. of New York, and a director of the McGraw-Hill Publishing Co. and the McGraw-Hill Book Co. died in New York June 10.

Jacob Lones Knott, 40, chemical engineer at National Laboratories, Oak Ridge, Tenn., for several years, died of a heart attack June 8.

Ernest M. Symmes, 60, Hercules Powder Co. executive, died in Wilmington June 16.

Charles August Mann, 63 professor and chief of the Department of Chemical Engineering at the University of Minnesota, died June 25.



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INDUSTRIAL NOTES

- Great Lakes Carbon Corp., Niagara Falls, will increase its electrode production this summer when it begins commercial operations at its Morganton Works, Morganton, N. C.
- Combustion Engineering Superheater, Inc., New York, has dedicated its new Kreisinger Development Laboratory in Chattanooga.
- General Aniline & Film Corp., New York, has elected James Forrestal vice president in charge of both the Ansco and Ozalid divisions. He succeeds E. A. Williford who has resigned.
- Bemis Bro. Bag Co., St. Louis, Mo., has announced that its multiwall plant in Houston has reached full production.
- Jefferson Chemical Co., Inc., has transferred its executive offices from 30 Rockefeller Plaza to 711 Fifth Ave., New York.
- Phillips Petroleum Co., Bartlesville, Okla., has made Lawrence R. Sperberg manager of market research evaluation in its Philblack sales division.
- Dow Chemical Co., Midland, Mich., has moved its industrial applications laboratory from Ann Arbor, Mich., to Bay City, Mich.
- Air Reduction Co., New York, has opened a new oxygen plant in Flint, Mich. The plant, built at a cost in excess of \$250,000, will produce over four million cubic feet of oxygen per month.
- Griscom-Russell Co., New York, has announced the retirement of its president, Russell C. Jones. He will continue to act as a director of the company. Mr. Jones will be succeeded by Kenneth B. Ris. Charles D. Steffans has been elected vice president in charge of sales and James W. Elizardi has been elected vice president in charge of petroleum sales.
- George Uhe Co., New York, has named Henry Interdonati to head its chemical department.
- Surface Combustion Corp., Toledo, Ohio, has appointed Berton M. Sharpe sales engineer to cover the territory of southern Indiana, southwestern Ohio and northern Ken-

- tucky, for its standard furnace di-
- Eastman Kodak Co., has announced that its subsidiary, Holston Defense Corp., has started operations at the Holston Ordnance Works in Atlanta, Ga.
- Mid-South Chemical Co., Inc., Memphis, Tenn., has been organized to distribute anhydrous ammonia as nitrogen fertilizer.
- Whitehall Pharmacal Co. is moving its Knoxville, Tenn., plant to Elkhart, Ind.
- West Virginia Pulp and Paper Co. plans the construction of new plant at Charleston, S. C., provided a 284-acre tract of marshland can be obtained from the federal government.
- Girdler Corp., Louisville, Ky., has negotiated a contract with Freeport Sulphur Co., New York, to build a 40 ton per day sulphur recovery plant.
- Ohio Stainless & Commercial Steel Co., Cleveland, has appointed Clayton E. Scholes general manager. Nate A. Wade has been appointed assistant manager and Owen W. Brock, warchouse manager.
- Hooker Electrochemical Co., Niagara Falls, N. Y., has named William F. George its New York district sales manager.
- Mead Corp., Chillicothe, Ohio, has named Donald F. Morris vice president in charge of procurement. Mr. Morris will be succeeded as manager of the Kingsport, Tenn., plant by George F. McCrea.
- Emulsol Corp., Chicago, Ill., has broken ground for a 21,000 sq. ft. addition to their organic chemical plant. It is expected to cost \$150,000 and will be used as warehouse space and possibly later for additional manufacturing facilities.
- Continental Screw Co., New Bedford, Mass., has appointed Victor Ladetto sales manager and Donald H. Sleeper assistant sales manager.
- Koppers Co., Inc., Pittsburgh, Pa., has contracted to buy the Freyn Engineering Co., Chicago, Ill. Freyn is (Continued)

four typical flow-metering services of Hagan Ring Balance Dual Meters

The Hagan Ring Balance Dual Meter is, essentially, two meters housed in a single standard-size meter case and recording on a single chart.

Both of the ring assemblies used may be high pressure, or both low pressure, or one may be high and one low. They may operate independently, or they may be linked together so as to produce a compensated record.

These four applications are typical of the flow measurements which are possible with this versatile meter:

 Measurement of two independent flows, such as air flow and steam flow, or air flow and gas flow, recording both on the same chart and thus providing a direct record of the relation between the two.

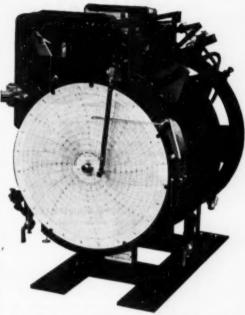
2. Independent measurement of two flows, with automatic totalization of these flows, as for example, steam flow from a boiler having two outlets, or to a process having two inlets.

3. Measurement of two flows and of the difference between them. In the case of a split flow this permits measurement of main flow and of one portion, the difference being the other part of the split flow. Any two of these flows may be automatically integrated; all three may be recorded on the chart.

4. Measurement of reverse flows, either with or without automatic integration of the net difference. This application is particularly useful in the case of

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One common type of Ring Balance Dual Meter is the Hagan Boiler Meter, shown above. Low pressure ring measures air flow! high pressure ring measures steam flow.

tie-in lines between boiler houses; where utilities or plants exchange gas; and in similar situations.

The Hagan Ring Balance principle applies also to measurement of the specific gravity of liquids, and density of gases, hence the Dual meter is used to measure flows in which these factors must be taken into account. Measurement can be compensated for temperature or pressure or both.

For more detailed information, fill in the coupon below or write, describing the particular application in which you are interested, to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

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For 37 years we have been solving measurement problems by supplying standard or special instruments to accurately measure pressures, vacuums and flows of liquids and gases. We have constantly improved, developed and diversified the line so as to meet fully all needs of the field.

U-TYPE MANOMETERS

The Clean-Out Manometer (at left) for line pressures up to 100 lbs. per sq. in. A wing nut permits the Manometer body and tube to be disconnected from the head—the tube cleaned with a brush furnished or tube replaced, and the instrument reassembled without disconnecting the head section from the piping. Send for Bulletin No. 1.

The Model A-995 WM Manameter for line pressures up to 400 lbs, per sq. in. These instruments are built with heavy walled annealed straight Pyrex tubes, gland packed top and bottom in steel end blocks and clamped to the body at fixed intervals to prevent distortion. Catalog Sheet A-995 WM gives complete details.



Model A-275 WM (at left) is a direct reading type for line pressures up to 190 lbs. per sq. in. Standard construction; ranges — from 6" to 24". Wall mounted type shown; also available in flush mounting. Ask for Catalog Sheet A-275 WM.

SIGHT FEED BUBBLER

This Sight Feed Bubbler with 2½" dia. bowl of Pyrex glass is good for line pressures up to 50 lbs. per sq. in.; of plastic, for pressures up to 100 lbs. Sturdily built with brass or semi-steel body. Supplied in ring type (shown) and strap type. Needle valve controls bubbler rate. Ask for Bulletin 21.





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an engineering firm specializing in design and construction of blast furnaces and open hearth furnaces, and in the engineering of mills, power stations, and other steel mill facilities. The acquisition also includes the Open Hearth Combustion Co., a Freyn subsidiary.

Libbey-Owens-Ford Glass Co., Toledo, Ohio, has added Frank J. Whelihan to the staff of its Plaskon division, Chicago.

Edward Ermold Co., New York, has appointed E. King Graves sales manager.

Petro-Chem Development Co., New York, has appointed Flagg, Brackett & Durgin, Inc., Boston, to represent them throughout New England

Hilton-Davis Chemical Co., division of Sterling Drug Inc., has inaugurated a Customers' Service Laboratory Division in Cincinnati, Ohio. Richard Van Vyven has been placed in charge of the new division.

Cochrane Corp., Philadelphia, has acquired for cash substantially all of the capital stock of Liquid Conditioning Corp., Linden, N. I.

Ungerer and Co., Totowa, N. J., has elected F. H. Ungerer chairman of the board. K. G. Voorhees has been made president and treasurer.

Copper Alloy Foundry Co., Hillside, N. J., has appointed James E. Ziegler to its sales engineering force. He will be stationed in Cleveland.

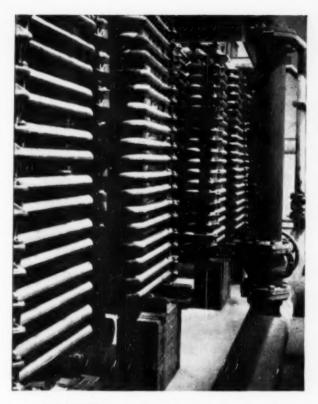
Shell Chemical Corp., New York, has appointed W. E. Keegan district manager of its Detroit office.

A. Gross & Co., New York, has put M. J. McCarthy, vice president and treasurer, in charge of purchases. Eugene W. Adams, vice president, succeeds Mr. McCarthy in charge of sales.

Lunkenheimer Co., Cincinnati, Ohio, has appointed Harold H. Layritz sales manager and Roland J. Sardieck assistant sales manager.

E. I. du Pont de Nemours & Co., Wilmington, Del., plans to build a \$2,000,000 finishes research laboratory in Philadelphia. Construction will begin soon and it is expected the building will be ready for occupancy late in 1950.

(Continued)



FOR

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NATIONAL CAST IRON CONDENSING AND COOLING SECTIONS



EFFICIENT

Integrally cast longitudinal fins interrupted by swirl strips increase heat transfer rate, reduce pressure losses. External design promotes unrestricted flow of water with minimum splashing. Far less water is required. In submerged installations, National Sections collect less foreign matter, give high performance longer.

DURABLE

Gray cast iron of exceptionally high quality and close grain goes into National Sections. Corrosion resistance under varied and severe conditions is high . . . heavy scaling and growths greatly reduced. Turns reinforced against corrosion. No "battery action" in handling electrolytes.

COMPACT

National Sections require far less space for a given amount of heat transfer. In certain installations, National Sections require only one-third the space needed by competitive equipment.

ACCESSIBLE Component parallel stacks of National Sections can be installed, serviced, dismantled easily. Support lugs are cast integrally. Sections are self-aligning, self-supporting no auxiliary bracing needed.

NEW CATALOG

Installation and Engineering Data

Catalog No. HT-20, just off the presses, gives you full information about the use of National Sections in varied applications. Design features and physical characteristics are explained in detail. Typical installations are pictured and described.

Catalog includes very complete data and curves for pressure drop and heat transfer and should prove a welcome addition to the process engineer's tile. Detail drawings of fittings and accessories specially designed for National Sections are shown along with dimensional data. A simplified

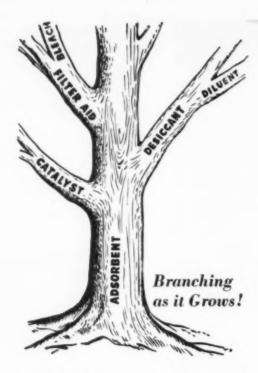
data sheet makes it easy for you to request specific engineering information or service

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HEAT TRANSFER DIVISION THE NATIONAL RADIATOR COMPANY

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introduced by the Floridin Company almost a half-century ago as a superior adsorbent for removing tars, gums, color bodies, etc., from petroleum oils

Has gradually extended its usefulness to the benefit of various industries.

The Floridin catalog now offers more than a score of different products of Fullers Earth and Activated Bauxite for the requirements of

Oil Refining Desulfurization Dehydrogenation Solvent Reclamation Pipe Line Drying Polymerization Treatment of Waste Selective Catalysis

Water Treatment Formulation of Insecticides and Fungicides

Specify— FLORIDIN Fullers Earth-Activated Bauxite PRODUCTS

FLORIDIN COMPANY

(Department A, 220 Liberty St.)

(Warren, Pa.)

INDUSTRIAL NOTES, cont. . .

American-Marietta Co., Chicago, has appointed Austen F. Tomes sales manager of its Valdura division.

King & Lang, Inc., Norwalk, Conn., has changed its name back to Robert J. King Co., Inc.

Union Carbide and Carbon Corp., New York, has appointed Paul J. Doyle, Jr., district manager for the entire Texas area for its subsidiary, Carbide and Carbon Chemicals Corp.

F. W. Berk & Co., Inc., Wood-Ridge, N. J., has appointed Millmaster Chemical Corp., New York, as its exclusive selling agent. Robert J. Milano has been made president of the Millmaster Chemical Corp., formerly the Millmaster Chemical Co.

Armco Steel Corp., Middleton. Ohio, will put into operation a fourth major unit for continuous production-line coating of flat-rolled steel in a bath of molten zinc or aluminum.

Aro Equipment Corp., Bryan, Ohio, has appointed Aro Sales & Service, Inc., as its distributor on the Pacific Coast.

L. O. Koven & Brother, Inc., Jersey City, N. J., has appointed W. C. Osha plant superintendent of its Dover fabricating plant.

Rockwell Mfg. Co., Pittsburgh, Pa., has added C. S. Quillen to its sales engineering staff.

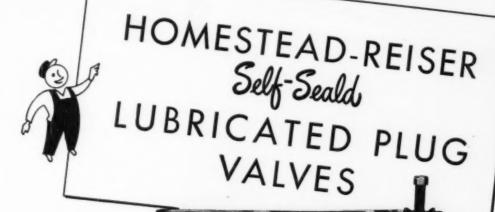
Ansul Chemical Co., Marinette, Wis., has completed an education soundslide film, "Solids in Refrigeration Systems."

Drexel Institute of Technology, Philadelphia, will inaugurate with the fall term a program of graduate work in engineering, physics and chemistry leading to the master's degree.

American Sugar Refining Co., New York, has enlarged its executive staff with the election of three new vice presidents. They are: Victor L. Johnson in charge of refinery operations; William F. Oliver in charge of raw sugar buying; and G. Vincent Pach to serve as chief financial officer. George F. Lamb, Jr., was elected assistant treasurer.

American Cyanamid Co. has consolidated the research, process develop-(Continued)

You can't buy A LOWER COST-PER-YEAR VALVE than



They are the <u>lowest-priced</u>, full-port-area plug valves in their pressure and temperature range

And they outlast all other lubricated plug valves in their class. Every one of their many outstanding advantages including

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. . . are features asked for by engineers and operating men of industry.

Proof of their long, economical, dependable performance has been established in practically every industry during the past seven years. And at their new low price, they are more than ever your lowest cost-per-year fluid control.

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How the "Self-Sealed" Principle Works

In addition to a full lubricant seal around the ports and around the top and bottom of the valve, the wedge-action of the plug under line pressure, constantly presses the finely-finished surfaces of the plug outward against the seating surfaces of the body. This self-sealing action keeps the plug surfaces in contact at all times with the mirror-like bore of the body. The plug thus automatically adjusts itself for wear, assuring extra long life and maximum leakless service.

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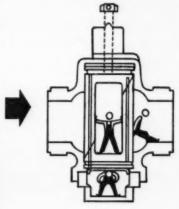
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CHEMICAL ENGINEERING-July 1949







DRACCO Pneumatic Conveyors are economical for small as well as large operations. They move chemicals, grains and granular materials from receiving to storage in any part of plant, even up many floors. Materials may be moved from one building to another, under or over streets or railroad tracks. DRACCO Pneumatic Conveyors are CHEAPER and BEITER than manpower. In face of keen competition it is good business to make every possible saving. Why not consult DRACCO Engineers and have them check your present methods. They can probably save you money.

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4071 E. 116th St., Cleveland 5, Ohio New York Office: 130 W. 42nd St.

DUST CONTROL EQUIPMENT PNEUMATIC CONVEYORS • METAL FABRICATION

INDUSTRIAL NOTES, cont. . .

ment and dyes technical service of its Calco Chemical Division into a single department. It will be headed by K. H. Klipstein.

Titan Mfg. Co., Bellefonte, Pa., has named L. C. Newton sales representative for North Dakota and Minnesota.

Monsanto Chemical Co., St. Louis, Mo., has appointed John B. Trotter as assistant general branch manager of its Birmingham, Ala., sales district.

Allied Chemical & Dye Corp., New York, has announced renewal of its awards of 31 graduate fellowships in 24 universities, colleges and institutes of technology for the year 1949 mainly in the fields of chemistry and chemical engineering.

Esso Standard Oil Co., New York, has elected E. H. Collins a director. He continues as general manager of marketing operations.

Chase Bag Co., Chicago, has named J. F. Kressler to direct operations of its Detroit office.

United States Rubber Co., New York, has completed a new warehouse at South Pulaski Rd. and 42nd St. in Chicago.

Cleveland Builders Supply Co., Cleveland, has just completed a \$100,-000 addition to its West 3rd St. plant, which will be used to process perlite ore.

Sharp & Dohme, Philadelphia, has made William G. Knapp assistant sales manager of Latin American sales

Bareco Oil Co., Tulsa, has appointed Bruce H. Clary to the position of vice president and director.

Southwest Research Institute plans to establish a division of oceanography and meteorology and a division of petroleum technology in Houston.

Goodyear Tire & Rubber Co. has appointed the Merryweather Foam Latex Co., Akron, to distribute its foamed rubber materials.

Hooker Electrochemical Co., Niagara Falls, N. Y., has promoted S. I. Anderson to the position of assistant to the general sales manager. T. H. Trimble has been made eastern sales supervisor. —End







Expansion Joint

The cloak of mystery is gone - for most services, the new 24 page CMH "Design Guide" simplifies selection and application of expansion joints to a matter of easy-to-use tables. Entering these tables with basic data on your installation you can find the expansion joints necessary to meet your requirements.*

The CMH "Design Guide" also provides a helpful source of general information on expansion control and presents technical data and specifications for CMH Expansion Joints.

Write for a copy of the CMH "Design Guide" and on your next job specify CMH Expansion Joints and eliminate the headaches that are so often a part of selection of this equipment.

*CMH ENGINEERED APPLICATION SERVICE is available for unusual installations. Competent piping specialists will analyze your problems and make recommendations.

CMH FREE-FLEXING EXPAN-SION JOINTS for pressures to 30 psi.; temperatures to 1400°F. Sizes to

24" I.D. Flanges or welding ends. Stainless Steel or Copper.

CMH CONTROLLED-FLEXING EXPANSION JOINTS with precision mated control rings for pressures to 300 psi.; temperatures to 1400°F. Sizes to 24" I.D. Flanges or welding ends. Stainless Steel or Copper.

FOR HIGHER PRESSURES special CMH Expansion Joints can be furnished. Recommendations will be made on receipt of installation details.

CMH-ONE dependable source for every flexible metal hose requirement

CMH manufactures all standard types flexible metal hose, both convoluted and corrugated in a variety of metals; expansion joints for piping systems, stainless steel and brass bellows; various conduits and special assemblies of these components



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MAYWOOD, ILLINOIS

Plants at Maywood, Eigin and Rock Falls, Illinois In Canada: Canadian Metal Hose Co., Ltd., Bramston, Ontar identifies CMH products which have served industry for more than 47 years

NO CHEMICAL CAN ATTACK TEFLON GASKETS

THESE Gaskets resist all Chemicals, except molten alkalis. You can obtain a perfect seal which outlasts conventional gaskets by many months. Withstand temperatures from minus 160° to plus 525°F. Gaskets of all styles and sizes to fit all types of processing equipment.

Consider the following performance records:

CHLORINATED SOLVENTS.
Manhole Telflon Gaskets on glasslined reactors, in service one year
with plate being opened daily.

BROMINE. Pfaudler Tank Cover Teflon Gasket. Still in service after eight months.

BORON FLUORIDE. Pipe flange Teflon gaskets still in service after six months.

CARBON TETRACHLORIDE AND ACETIC ACID. Teflon Gaskets on tank in service one year.

Special parts available in Teflon—bushings, sleeve bearings, washers, packings, etc. Many available from stock.

Wherever, whenever you have a nasty gasket or packing problem—write or call . . .

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11 Broadway, New York 4, N.Y.

CONVENTION PAPER ABSTRACTS

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MANAGEMENT

. . . Decentralization

I. D. Brent

In our time there has been a revolution in warfare. Destruction can, in the foreseeable future, be brought to our civilian population and to our industrial system.

Now we must think of two kinds of defense: military defense and dispersion or space security for our people and industry.

Dispersion breaks down into two

types: one is dispersion of industry and population from one region to another—a form of migration. The recent shift of United Aircraft from Bridgeport to Dallas is an example. This may be called a deregionalization.

The other type is the deconcentration of cities or de-urbanizating—the introducing of space among the urban and industrial units of the metropolitan area. To deconcentrate or de-urbanize involves fewer practical or economic problems in peacetime than to deregionalize or to migrate. You are still nearer your old market, your labor supply, and your power sources.

This deconcentration can be rapid—say 3 to 10 years, or very slow—say 25 to 100 years. The first is costlier and would no doubt meet with considerable resistance.

The slower type would be more practical because industries have a certain rate of obsolescence, and in 30 to 50 years new plants are usually needed.

Most people will agree that no government could undertake the transplanting of existing large industrial (Continued)

VARNISH Fumes VANISH

WITH MILITI-WASH



These Varnish Cookers with hoods specially designed by Schneible Engineers for use with Schneible Multi-Wash Units have improved working conditions by eliminating stifling varnish fumes. In addition, valuable byproducts have been salvaged, thus making the installation pay for itself.

Many enthusiastic users of Schneible Multi-Wash Systems in the Chemical Industry are our best recommendation.

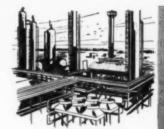
CLAUDE B. SCHNEIBLE COMPANY 2827 Twenty-Fifth Street Detroit 16, Michigan

MULTI-WASH COLLECTORS

Madel JC—from 1906 to 20,000 cm capacity or in malificia unit. Medel NC—milto capacities them 1906 to 30,000 cm capacities them 1906 to 30,000 cm capacities. The effect of the large capacities. The effect of the large capacities. The effect of the large capacities of the effect of the large capacities of the effect of the large capacities of the effect of the effe



SCHNEIBLE



ENSOLINE PLANTS



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OFFSHORE PLATFORMS



BRIDGES





HIGHWAYS



RAILRORDS



CHEMICAL PLANTS



MILITARY INSTRLLATIONS

Brown & Root, Inc., prides itself on an organization that has met and vanquished the problems surrounding nearly every type of heavy construction. Experience is a stern but thorough teacher, and discoveries made on one project save other clients much time and many dollars.

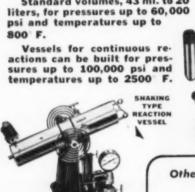
As long as there is progress there will be new problems, but most of them will be first cousins to the old ones we learned about the hard way.

Tell us your troubles. We may have the solution already worked out.

HIGH-PRESSURE REACTION VESSELS

VARIOUS types, with or without shaking or stirring mechanisms, heating jackets, and removable corrosion-resistant liners.

Standard volumes, 43 ml. to 20 psi and temperatures up to



STIRRING

TYPE

REACTION VESSEL

Other Superpressure

Products VALVES . . . Various types for pressures up to 100,000 psi.

Special valves up to 3-in, pipe size for pressures up to 10,000 psi.

FITTINGS AND TUBING . . . For pressures up to 100,000 psi- couplings, elbows, tees, crosses, adapters, and gage, gas-tank and electrical con-

Tubing of stainless steel and other

PUMPS AND COMPRESSORS . High-pressure liquid pumps (30,000 psi), liquid-pressure intensifiers (100,000 psi), hydraulic gas boosters (30,000 psi), and gas compressors (25,000 psi).

INSTRUMENTS . . . For indicating and controlling pressures, for calibrating other types of pressure instruments, and for measuring and controlling

PILOT PLANTS . . . Aminco engineers are prepared to offer advice on style, size, and general arrangement of pilot plants, and to undertake the design and manufacture of the entire equipment,

30 YEARS EXPERIENCE

As pioneers - and still leaders, in the superpres-sure field. Aminco has an unmatched fund of experience which is at your dis-posal for the solution of your specific high-pressure problems.

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CONVENTION PAPERS, CORT. . .

units to less vulnerable areas due to the prohibitive cost, if for no other reason. It is equally impractical to put all key industries underground.

Since this country is a free, democratic nation dedicated to the principle of free enterprise, no government should, even if it could, dictate to each industry what it must do. Therefore. for this, as well as financial reasons, it seems that whatever is done must be done by industry itself.

We suggest that, as a preliminary step, industry can start thinking seriously about the problem and bear it in mind when new facilities are being built, or when existing facilities or plants are being expanded or altered due to the increased volume of business, the manufacture of new lines, or the replacement of plants due to obsolescence or uneconomical operation.

Fortunately and fortuitously, there is already a definite trend toward decentralization of industry for reasons other than that of defense. This trend should be accelerated since the results of dispersion will be of benefit not only to industry but also to the country at

Regarding what localities can do, it may be appropriate to suggest that each of the larger industrial cities might determine its own vulnerability pattern, and formulate both long and short range plans calculated to minimize any problems presented by an emergency.

I. D. Brent, Industrial and Governmental Dispersion Division, National Security Resources Board, before the American Industrial Development Council, Washington, D. C., April 5, 1949.

BIOCHEMISTRY

. . . Kinetic Studies

Melvin Calvin

The over-all reaction of photosynthesis can be written as:

 $CO_2 + H_2O + E(h_v) \rightarrow (CH_2O) + O_2$ Plants, like all other living things, respire and the reaction for this is the reverse of the one written for photo-

 $CO_2 + H_2O + E(\sim p) \leftarrow (CH_2O) + O_2$

Respiration reaction can be observed by placing plants in an atmosphere of oxygen in the dark and observing the absorption of oxygen and the evolution of carbon dioxide. When the light is turned onto the plant the absorption of carbon dioxide overtakes the respiratory evolution and there is a net decrease in the amount of carbon dioxide over the plant. Any measurement of the rate (Continued)



BAKER PERKINS INC.

*B-P makes mixers for all types of industrial liquids plastics, and solid materials



Centrifugal or Rotary Positive? Which type of air or gas handling equipment is best suited to your needs? The answer depends upon the specific job—and you'll get the cold, unbiased facts from R-C dual-ability.

We can give you this dual choice because we build both—and we are the only blower manufacturers who do so. Further, our range of sizes, capacities, pressures and other characteristics is so wide that we can usually match or very closely approximate even exacting specifications.

By such fitting of equipment to the requirements of the job, you get superior performance, dependability and long life from your R-C units—the natural result of 95 years of blower-building experience.

ROOTS-CONNERSVILLE BLOWER CORPORATION 907 Illinois Avenue, Connersville, Indiana

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Convention Papers, cont. . .

of photosynthesis must be a measurement of the difference between these two reactions.

Availability of isotopic carbon has made it possible to distinguish carbon dioxide originally in the gas phase from that which appears through respiration. By labeling the initial gaseous carbon dioxide, using unlabeled plant material, one can distinguish carbon dioxide originally in the gas phase (labeled) and that which returns to the gas phase, necessarily, unlabeled. Thus, by measuring the radioactivity per mol of carbon dioxide gas, one finds-if respiration produces an important amount of carbon dioxide gas-that the quantity decreases from time to time. By comparing this decrease to the net rate decrease of total carbon dioxide, respiration occuring in the light can be calculated.

It is possible to set up general kinetic equations involving as parameters the rate of respiration in the light and the ratio of the rates of utilization of carbon 14 and carbon 12. One can arrive at the best values for these two parameters to reproduce the data and these are a value of approximately 0.85 for the ratio of the rates of utilization of carbon 14 and carbon 12 and a value of about 0.5 for the ratio of respiration in the light to that in the dark.

This quantitative analysis, however, is subject to the assumption that the carbon dioxide generated by respiration is completely mixed with the gas phase carbon dioxide before it is reincorporated into the plant by photo-synthesis. If some of this respiratory carbon dioxide were reincorporated by photosynthesis prior to such mixing it would not have any effect on the dilution of the specific activity of the residual gaseous carbon dioxide and would thus fail to appear as light respiration in our calculations. While part of the lowered respiration in the light given above might be due to this cause, there is little question of a marked influence of light respiration.

Meivin Calvin, University of California, before Southern California Section, American Chemical Society, March 4, 1949.

RUBBER

. . Cold Facts on Cold Rubber

R. P. Dinsmore

Under present price structures, natural rubber can be delivered in New York at a cost below which synthetic can be presently manufactured. Last (Continued)

DU PONT REPORTS

OUTSTANDING PERFORMANCE

OF "TEFLON"

FOR GASKETS IN CHEMICAL INDUSTRY





- OUTLASTS OTHERS UP TO 25 TIMES
- EXCELLENT HEAT-RESISTANCE
 (Temperolures up to 550°F.)



High pressure reaction kettle, with gaskets covered with "Teflon," made by Pfaudler Co., Rochester, N. Y. Pfaudler also uses and recommends gaskets of "Teflon" on other units. Pfaudler says, "Gaskets shielded with "Teflon' have been successfully used on our equipment under highly corrosive conditions, under which gaskets of other materials have failed."

DU PONT'S unusual "Teflon" tetrafluoroethylene resin shows excellent resistance to temperatures from - 100°F to 550°F...has good dimensional stability ... is inert to all chemicals (except molten alkali metals and fluorine under extreme conditions). Gaskets of "Teflon" have been used successfully in contact with bromine. chlorine, sulfur dioxide, concentrated sulfuric acid, aqua regia, thionyl chloride, organic solvents including halogenated hydrocarbons, etc. They have been used for over a year in operations where other gaskets have lasted only two weeks, "Teflon" is superior in chemical resistance to

any other known gasket material.

Perhaps "Teflon" can solve a tough problem for you. Du Pont supplies "Teflon" as sheets, rods, tubes, tape and in a shredded form. Write today on your letterhead for more information. Our technical staff will welcome the opportunity to discuss your problem and suggest possible uses of "Teflon." If you wish, we will supply names of gasket manufacturers. E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Main Sales Offices: 350 Fifth Avenue, New York 1. New York: 7 South Dearborn Street, Chicago 3, Illinois; 845 East 60th Street, Los Angeles 1, California.



PFAUDLER KETTLES used by Ciba Pharmaceutical Products, Inc., in making pyribenzamine. Ciba reports, "Gaskets of "Teflon" have served in these kettles over a year. Others deteriorated within a few weeks."



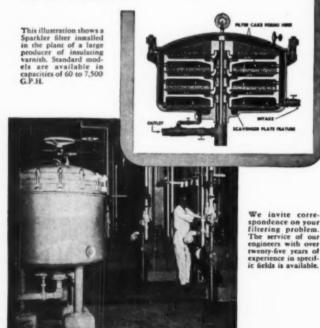
SPARKLER horizontal plate FILTERS

 preferred by many in chemical processing plants because of two outstanding features — uniform microscopic filtration — complete recovery of product.

Unlike the construction of some other types of filters the horizontal plates in the Sparkler allow the filter media to form in an even cake of uniform thickness, built up in a horizontal position without stress and therefore not subject to cracking or slipping under pressure, thus assuring uniform filtration either with intermittent or continuous flow.

Complete recovery of product is obtained by "wash through" or "blow down" of cake without removal from filter. The Sparkler scavenger plate, with independent control valve, acts as an auxiliary filter, filtering each batch down to the "last drop" leaving no holdover.

Plates are available in two thicknesses, deep plates for liquids carrying a large proportion of solids and shallow plates for polishing operations. When shallow plates can be used the filter area is increased within the same size tank.



SPARKLER MANUFACTURING COMPANY

Mundelein, Illinois

CONVENTION PAPERS, CORT. . .

year the United States consumed some 1,069,000 tons of rubber, of which 32 percent, or 345,000 tons, was GR-S.

Some 110,000 tons of synthetic were used voluntarily by the industry without government order, since the supply of natural rubber was still limited. Even so, the GR-S consumption was down about 100,000 tons from the tonnage used in the preceding year. With crude rubber showing a decline in price, the pressure to use more crude is increasing. Hence, the question of quality of the synthetic produced is of prime importance.

The advent of "cold" rubber, while stimulating to rubber technologists and a great boon to news writers, has created considerable confusion among rubber technologists and laymen alike, partly because of varying opinions as to the actual quality characteristics of the material. This confusion, too, is aggravated by a failure to analyze complete effects in relation to those of natural rubber.

Experience, thus far, with cold weather skidding indicates it to be worse than for the old GR-S. Hot weather cracking, at normal driving speeds, is still insufficiently determined.

Cold rubber, like regular GR-S, requires carbon black loading to have sufficient toughness even for carcass stocks. Thus, even though it is more resilient than the old GR-S, this improvement is not sufficient to overcome the handicap caused by the use of black, especially for large tires.

Even in treads, the wear improvement accomplished with cold rubber only surpasses natural rubber when one certain type of black is used, and then any advantage in resilience over the conventional GR-S is lost.

There is no doubt that, when used with special blacks, cold rubber gives better tread wear. We have yet to learn whether other drawbacks will offset this advantage over crude, or indeed, whether similar effects cannot be produced with crude rubber itself.

R. P. Dinsmore, Goodyear Tire & Rubber Co., before Canadian and American rubber chemists, Niagara Falls, Ontario, May 6, 1949.

MANAGEMENT

. . . Berylliosis

Merril Eisenbud et al.

Beginning in the latter part of 1947, a group of cases having diagnoses consistent with that of chronic pulmonary granulomatosis as seen in beryllium workers, was reported among residents (Continued)

DUSTUBES COST LESS

Ease of Inspection

CLEAN, SAFE, SIMPLE NO PARTS TO REMOVE

Filter Replacement

TAKES ONLY A FEW SECONDS
REQUIRES NO TOOLS

Dustube Filters

NO ABRADING METAL CONTACT EASY TO SHIP, STORE, HANDLE

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NEARLY 100% EFFICIENT

Better Dust Removal

SIMPLE, FAST, THOROUGH SHORTENS CLEANING TIME

TO MAINTAIN AND OPERATE



DUST COLLECTOR MAINTENANCE CUT TO THE BONE

Good equipment maintenance is profitable insurance — but the cost must be kept low. With DUSTUBE, the design is so simple and there are so few working parts to wear that only reasonable attention is necessary. One man can service it without any tools. Inspection is an easy, accurate job from the clean air side . . . no heavy frames or screens to unbolt before the condition of the cloth can be determined. And when it comes to an infrequent tube replacement, only a few seconds are needed to hook the new tube on the shaker channel and insert the bottom in the cell plate over the dust hopper.

To these economies add the savings affected in operating DUSTUBES such as power savings, longer cloth life, shorter and less frequent cloth cleaning periods, less down-time... and you have some very sound reasons for investigating DUSTUBES further.



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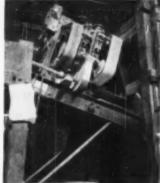
(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)

7 S. Byrkit St. Michawaka, Indiana









 This super high intensity Dings Cross Belt Separator removes minute particles of iron oxides from finely divided dry materials.

IRON, the defiler, finds its way into nearly every product and every process—tacks, clips, hairpins, rust, tools, wire, iron fuzz from machinery abrasion. It can pock mark fine china and glass, scratch milady's complexion, discolor and streak building materials, wreck coal stokers, spoil chemical solutions, break teeth, kill cattle . . . it is a nogood nuisance and a menace to the public and to industry.

For 50 years Dings has helped industry serve its customers iron-free products with magnetic separators especially suited to the problem. WRITE for your copy of "Magnetic Analysis."

DINGS MAGNETIC SEPARATOR CO.4730W. Electric Ave., Milwaukee 14, Wis.

Dings

MAGNETIC STRENGTH

CONVENTION PAPERS, CORt. . .

in the vicinity of a commercially owned plant producing beryllium compounds. Since it was anticipated that the Atomic Energy Commission would require considerable amounts of beryllium metal and compounds, it was desirable for the commission to secure information as to the conditions required for the safe operation of a beryllium producing plant. For this reason, the commission cooperated with the management of this beryllium producing plant to determine the medical and environmental factors involved in the reported cases.

In comparing the concentrations inside and outside of the plant, a factor of 3 can be applied to the neighborhood concentration because this plant operated 24 hr. per day: residents in the vicinity were thus exposed continuously, as compared to the 8-hr. daily exposure of the employees. A larger, though unknown influence on the specific toxicity of the neighborhood contamination can perhaps be attributed to the fact that most of the effluent which was discharged at roof level passed through air cleaning apparatus, which together with elutriation effects within the plant undoubtedly resulted in neighborhood pollution of smaller particle size than existed within the plant.

Eleven cases have been reported among residents in the vicinity of the beryllium producing plant. In none was there a history of occupational exposure to beryllium.

Ten of the cases resided within a mi. of the plant. The distribution of cases with respect to the plant indicates that the incidence of disease was a function of the concentration to which the residents were exposed.

The eleventh case resided almost 2 mi. from the plant but occurred in a member of the household of an employee of this beryllium plant. The case is believed to have resulted from atmospheric contamination introduced to the household by workclothes of the employee. Based on air analyses during simulated home cleaning of workclothes, a daily laundering can result in the inhalation of 17 micrograms of beryllium.

An extensive air analysis program conducted in the vicinity of the plant yielded useful data on the levels of atmospheric contamination. The concentration at \(\frac{1}{2} \) mi. is of particular interest because the low concentrations beyond this distance have not produced known cases in the seven years that this plant has been in active operation. It is estimated that the average concentration \(\frac{2}{3} \) mi. from the plant

(Continued)

MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY SATURDAY BUFLOVAK EVAPORATORS FOR EVERY INDUSTRIAL PURPOSE, DRYERS, CHEMICAL AND FOOD PROCESSING EQUIPMENT.

CHEMICAL ENGINEERING-July 1949

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Operating at extremely low temperatures and safe pressures, this new Evaporator safeguards the good qualities of your concentrated product, even when run over long operating periods! And, always, there is a high recovery of solids.

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We know you will chalk up real savings with Buflovak ... a type Evaporator available for every industrial requirement. Buflovak Equipment includes Dryers, Solvent Recovery Equipment and Processing Equipment. We shall gladly send full information on request.

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Test after test, changes, improvements, simplifications . . . now the new C-O-TWO Dry Chemical Type Fire Extinguisher is ready, having features that make it one of the most efficient, fool-proof, easy-to-use fire extinguishers known.

SELF-CONTAINED UNIT... no extra gadgets protruding or complicated operating instructions . . . a real down-to-earth fire extinguisher that does a highly efficient job.

C-O-TWO DRY CHEMICAL IS FREE FLOWING... no syphon tubes or valves within the cylinder to become clogged or inoperative... special dry chemical formula developed to ensure proper flow ... discharge hose and nozzle remain empty until fire extinguisher is actuated.

TWO CONVENIENT SIZES to fit your fire fighting needs...20 pound capacity and 30 pound capacity ... both engineered for fast, positive action the instant fire strikes.

APPROVED . . . Underwriters' Laboratories, Inc. rating is B-I, C-I. C-O-TWO Dry Chemical is non-conducting, non-corrosive, non-freezing and non-toxic . . . highly effective on flammable liquid and electrical fires.

ON-THE-SPOT RECHARGING... no special tools needed...C-O-TWO Dry Chemical for recharging is sold in handy pre-measured 20 and 30 pound sizes as well as in a 50 pound bulk size... all sizes packed in durable moisture proof containers.

Act now for complete free information on our newest contribution to modern fire fighting . . . just clip this advertisement to your letterhead or calling card and mail today . . . no obligation.



C-O-TWO FIRE EQUIPMENT COMPANY

Sales and Service to the Principal Cities of United States and Canada APPILIATED WITH PYRENE MANUFACTURING COMPANY CONVENTION PAPERS, COUR. . .

during this period of time ranged from 0.01 to 0.1 μ per m^a. The cases appear to have resulted from exposure prior to 1946, when the $\frac{1}{4}$ -mi. concentration is estimated to have been approximately 0.1 μ per m^a.

The average daily concentrations of beryllium in the vicinity of a plant producing and processing beryllium should be limited to 0.01 a per m. There is no justification for applying these data as criteria in judging the hazard of exposed workers in the beryllium industry.

The plant in question has had a comparatively low incidence of berylliosis, despite the relatively high exposure to atmospheric contamination within the plant. No satisfactory explanation can be given for this discrepancy, but the specific toxicity of the "neighborhood" contamination may be enhanced by smaller particle size than would be expected within the plant.

The minimal exposure of the affected residents is consistent with the low beryllium content of tissues from two cases which have been autopsied. The lungs from these cases contained 0.07 and 0.10µ of beryllium per 100 g. of wet tissue.

The air analyses data, when related to the amount of effluent from this plant, are found to be in close agreement with theoretical methods of estimation.

Merril Eisenbud, W. B. Harris, B. S. Wolf, U. S. Atomic Energy Commission; R. C. Wanta, U. S. Weather Bureau; Cyril Dustan, Columbia University; L. T. Steadman, University of Rochester; before the American Industrial Hygiene Association, Detroit, April 7, 1943.

RESOURCES

. . . Conservation Quotient

E. G. Rochow

The time has arrived when we must stop thinking about more ways to exhaust natural resources and start thinking about ways to live on the energy supplies and the materials that are inexhaustible.

Petroleum provides a striking example of the plight in which the human race is rapidly involving itself. With an estimated 58 percent of America's original petroleum reserves gone, current efforts to avert a fuel crisis are centered in the synthesis of gasoline and oil from natural gas and coal. But these raw materials, in turn, can be exhausted. And besides there is competition for our single coal reserve on the part of the coal industry, the chemical industry, the metallurgical industries, and the electric power (Continued)

(A Quick Quiz on modern pH advancements)

Do you know ...



That Beckman pioneered modern glass electrode pH equipment?

Until Beckman pH instruments were developed, glass electrode pH equipment was a cumbersome, complicated laboratory curiosity. It was Beckman that pioneered today's simple, compact, highly accurate and completely dependable glass electrode pH equipment!



That Beckman pioneered virtually every major development in modern glass electrode pH equipment?

Such far-reaching advancements as the High pH Glass Electrode . . . the High Temperature Glass Electrode . . . the Unusually Rugged "X-9" Glass Electrode . . . as well as a wide range of other vitally important advancements in glass electrode pH instrumentation, were all pioneered by Beckman. Many of these advancements are still available exclusively in Beckman equipment!



That Beckman offers the industry's most complete line of glass electrode pH instruments?

Included in the complete Beckman line are instruments specially designed to combine the high precision and wide versatility necessary for advanced research, medical and laboratory applications... others that combine maximum simplicity and high accuracy with complete portability for plant and field applications... still others that combine maximum simplicity and high accuracy with the plug-in convenience of full AC operation... plus completely automatic pH equipment for continuous pH indication, recording and control on large-scale processing applications.

Do you know these important facts about BECKMAN ph control?



That Beckman also provides the industry's most complete line of modern glass electrodes?

Although glass electrode pH instruments are the most efficient pH equipment obtainable, no glass electrode pH instrument is better than the versatility, accuracy and dependability of the electrode assemblies available for use with it.

Beckman provides the industry's most complete line of glass electrodes for use with Beckman pH instruments—a type of electrode assembly to meet every industrial, research, laboratory and field requirement!



That there are so many money-saving applications for Beckman pH control that you may be losing important profits unless you make a complete investigation of your operations?

There is pH wherever there's water, water solutions, moist pastes, sludges, slurries or other moisture-containing substances. And wherever there is pH, chances are the operation can be done better . . . with greater uniformity and less waste at lower overall cost . . . by Beckman-controlling the pH of the various processing operations.



BECKMAN

For an informative, non-technical autiline of modern pit control — what it is and how it's used — send fer this free backlet "What Every Executive Should Know About pit."

NSTRUMENTS CONTROL MODERN INDUSTRIES

all Maters and Electrodes - Spectrophotomotors - Radiation Maters - Special Analytical Instruments

Could you pass this quiz on WET-TYPE dust collectors?

Important questions regarding Roto-Clone® wet-type dust collectors to which you should have the CORRECT answers.





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WRITE FOR THIS
FREE BULLETIN

Rate-Clane Bulletin 270A combains complete information on the design and application of both dry-and wat-type Rote-Clane dust collectors. Write for a capy taday—it has the enswers to your difficult dust collection problems.

*Roto-Clone is the trademark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types. Question No. 1—What efficiency can be expected from a wet-type dust collector on extremely fine dust?

Answer—Scores of Type W and Type N Roto-Clones are functioning daily at better than 98% efficiency on small micron particles such as found in foundry sand handling systems; ore crushing and screening; material drying, roasting and sintering operations. In fact, it is not uncommon to obtain efficiencies of 99.5% on such applications.

Question No. 2—Does operation of wettype dust collectors require a large volume of water?

Answer—The Roto-Clone system of bringing the dust to the water makes effective use of every gallon supplied. That's why the Type W Arrangement A requires the supply of less than ½ gallon of water for each 1000 CFM of dust-ladened air cleaned.

Where water disposal is a problem, the Type N Roto-Clone is available. This unit recirculates the water without aid of pumps or nozzles. Water consumption is limited to the small amount required to provide for evaporation.

Question No. 3-Is wet-type dust collection expensive?

Answer—The cost of a Roto-Clone system is no more than that of other dust collectors of comparable efficiency. Actually, due to the small space requirements and factory method of assembly, the installed cost of a Roto-Clone is usually less.

AMERICAN AIR FILTER COMPANY, INC.

326 Central Ave., Louisville 8, Ky.

In Canada: Darling Bros., Ltd., Montreal, P.Q.

24

ROTO-CLONE

DUST CONTROL EQUIPMENT

CONVENTION PAPERS, cont. . .

industries, in addition to the petroleum industry. Some day coal may be needed for food and so denied to all other industries.

Iron ore, copper, zinc, tungsten, lead, silver and mercury are among the other minerals which the country is rapidly using up.

To reverse this suicidal trend, a conservation quotient would be determined for a specific project by dividing the weight of inexhaustible material by the total weight of materials used. Multiplying the result by 100 would give a percentage scale which is readily comprehended and carries its own connotation of good or bad with respect to our future welfare.

The conservation quotient of a kilowatt-hour of electricity, for example, would be zero if the power were made in a city station using irreplaceable coal, but would be nearly 100 if it were produced by water at Niagara Falls.

The present-day automobile is one of our very worst devices because of its very low conservation quotient—it requires much scarce and valuable metal and feeds upon gasoline of zero conservation quotient. When a few ounces of metal are worn from the 3,000 lb. of motor and running gear, the machine is pronounced unfit and discarded.

The automobile manufacturer should lend the metal content of a car to the purchaser on a deposit basis, rather than sell it outright and rely upon the haphazard junking system to return part of it as scrap.

Man's present eating habits will have to be radically altered before many generations pass. It took nearly five acres of arable land per person to feed the United States in 1947. On this basis, even if every bit of land in the country except deserts, swamps and rocky areas were cultivated, only some 306 million people could be supported. Moreover forest lands could not be expected to yield as much of our present farms, and soil crosion would be greatly increased by cutting down all trees.

It would be better to continue growing trees and to use them for food. Although man cannot digest cellulose from trees directly, the cellulose could be converted into digestible sugars that would supply all carbohydrate needs, he said.

Meat and eggs as sources of proteins seem certain to vanish from the human diet for a beef steer converts only about 12 percent of its food to meat, and does worse at it when poorly fed.

Plant proteins and fish can be used for a time, but ultimately artificial (Continued)



For abrasive ladings Q.C.f. Lubricated Plug Valves with clear full circular ports* are ideal. Compact size is retained only through cylindrical plug design...straight-through flow with same shape and cross section as the pipe. Quick quarter turn to open or close...no exposed seats. For every reason Q.C.f. Valves should be your first choice.

*Also affered with full area rectangular parts.

Valve Division, 30 Church Street, New York 8, New York.



CHEMICAL ENGINEERING-July 1949

than 50 principal cities.



COMPILED FROM SIXTY-ONE YEARS OF SPECIALIZED EXPERIENCE IN SEPARATIONS Problem:

To recover clean mica from low grade ore.

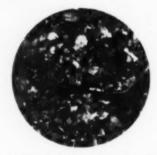
Solution:

\$ \$ & \$ Process—Air-Flotation. Here is photographic evidence* illustrating another successful application of separation by specific gravity through air-flotation.

The efficiency with which Sutton equipment was used here to recover clean mica from material composed of mica and gangue also emphasizes the engineering and economical feasibility of applying the S & S Frocess for the separation of virtually any type of dry granular particles from a component of carying bulk density.

Check into your own plant operations with imagination. Sutton equipment is doing a big job for virtually every type of industry. It could be your answer, too.

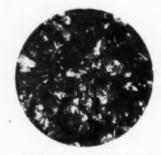
*Unretouched photographs taken during predeferery test.



"CRUDE AS RECEIVED" was composed of mica and gangue. Bulk of the material ranged from %" down to +20 mesh.



PRODUCT NO. 1, consisting of gangue particles, was separated out at the "heavy" end of the Specific Gravity Separator deck.



PRODUCT NO. 4 consisted of clean particles of mica, and was removed at the "lighter" end of the Separator deck.





Ballan, Chicago, Des Moines, Minnespelis, New York City, Pittsburgh, San Francisco, Columbus, Ga., Jackson, Mich. Fereign: Winnipeg, Canada; San Paulo, Brazil; London, England.

CONVENTION PAPERS, cont. . .

proteins probably will have to be provided through synthesis of their amino acids.

Ultimately the real problem will be to assure a continuing supply of atmospheric carbon dioxide from which plants can build their tissue. Carbon dioxide is steadily being soaked up by the oceans, and it will have to be recovered from them. If this problem and the others connected with nutrition are solved along the lines indicated, a United States population of about one billion people and a world population of fifteen billions would not seem unreasonable.

Clothing will not be much of a problem if there are plenty of trees for cellulose can be converted into synthetic textiles such as rayon, and plastics can be used in place of shoe leather. Worn rayon clothing can be turned to sugar and eaten.

For housing we are almost certainly driven to ceramic structures, with a very low minimum of wood and not even much steel.

Eugene G. Rochow, Harvard University, before North Jersey Section, American Chemical Society, May 9, 1949.

WASTE DISPOSAL

. . . Spent Chemicals

L. C. Burroughs and R. W. Carnahan

Disposal of various spent chemicals from petroleum refining demands as much attention as the removal of oil from refinery waste waters. Attention is called to the importance of minimizing the volume of spent chemicals by process changes or increasing the efficiency of utilization, and waste chemicals should be completely spent.

Several proved processes are available for the disposal of spent caustic soda and spent sulphuric acid sludges, which are responsible, directly or indirectly, for the majority of refiners' stream pollution difficulties. One method for removing the objectionable constituents of spent caustic is neutralization with waste sulphuric acid and sludges. When the caustic is neutralized the sulphides are converted to hydrogen sulphide and released as a gas, whereas the acid oils, which are insoluble at the lower pH, are removed later by gravity separation. The weakly acid solution is then drained to the sewer.

Another process available for treatment of caustic wastes involves scrubbing with flue gas from a boiler house. The gas is blown into the bottom of a tile-packed tower 60 ft. high and 3 ft. in diameter. The waste liquid is (Continued)

July 1949—CHEMICAL ENGINEERING

FOR USE IN-Preserving wood; Finishing paper and textiles; Flameproofing and dyeing textiles; Galvanizing; Manufacturing vulcanized fibre, batteries and glue.

FOR USE IN — Fertilizers and orchard sprays; dyeing and printing textiles; Electro plating; Electro galvanizing; making rayon, paint, varnish, glue.

At Wheatland, Pa., Maneely Chemical Company has one of the most efficient, modernly equipped chemical plants in the country.

Glass lined vats and equipment and a new process combine to give a new high in uniformity, purity



and quality.

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SYMBOL OF SAFETY AND ECONOMY IN HIGH PRESSURE COMPRESSORS

Way back in the days when compressors were called "blowers." Norwalk was a pioneer. Over the years it has led the way to higher pressures, but always with sturdy machines that give maximum safety and economy.

Norwalk Company, Inc.

South Norwalk, Conn.

Convention Papers, cont. . .

fed into the top in order to give countercurrent contact. In the reactions most of the phenols present in the waste are replaced and separated by carbon dioxide, and sulphides are converted into less objectionable compounds by oxidation through excess air in the flue gas. Gases from the tower are released into the boiler house stack and the treated waste water is discharged to the sewer.

With respect to the disposal of spent sulphuric acid sludge large quantities are eliminated by burning, and this method is quite successful pro-vided the furnace in which the material is burned has a high stack and provided the fumes from the stack do not prove objectionable in the vicinity of the refinery. One method of burning sludge is to accumulate it in a tank at the boiler house and fire it under a boiler, using a simple burner consisting of an open-end 1-in. pipe having an alloy tip mounted in an annular perforated ring through which steam is admitted for atomizing the sludge.

Some refiners use "volcanic" mills to process sludge to make it suitable for burning. The mill is a vertical cylindrical steel shell having a central motor-driven shaft on which toothed wheels are mounted. Sludge is pumped through the mill and in the process the chunks of material are broken into small particles and thoroughly mixed, producing a homogeneous liquid that may be burned through a simple burner using steam atomization. This mill may be used for processing heavy sludge from treatment of bright stocks, and is suitable also for fuel oil sludge and lighter sludges. In some instances fuel oil is blended with the sludge before it is passed through the mill.

L. C. Burroughs and R. W. Carnahan, Shell Oil Co., before 14th Midyear Meeting, American Petroleum Institute, Houston,

MANAGEMENT

. . . Depression Data

D. E. Faville

There no longer appears to be any doubt as to whether we are or are not going to have a business recession. We are in it. The big question is how deep will it cut, and how long will it last?

We are alert to the causes of the 1920 and 1929 depressions and have taken precautionary measures against a farm price collapse, a credit collapse, over-extension of inventories, and

(Continued)

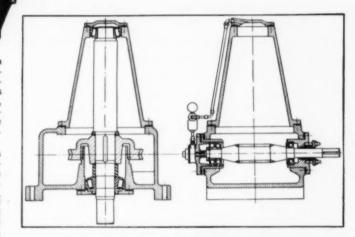
For drives requiring long, unsupported VERTICAL SHAFTS

... the <u>new</u> Philadelphia "Steeple" Type Worm Gear Speed Reducer fills a long-felt need.

The "Steeple" type Vertical Worm Gear Reducer was especially developed, and has had much successful use in the numerous Process Industries for driving: Agitators, Mixers, Circulators, Pumps, Washers,—or any other vertical type drive which calls for sturdy, reliable speed reduction.

The wide bearing span insures rigidity for the extended shaft—and the "dry-well" construction eliminates the necessity of a stuffing box on the vertical shaft. And, to insure positive lubrication of the upper bearing on the vertical shaft, an automatic reversing oil pump, together with a filter, is used.

Write for full details on your business letterhead.



The views above illustrate cross sections through the worm and worm gear shafts.

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Industrial Gears and Speed Reducers LimiTorque Valve Controls



Silica Gel, a cracking catalyst for high octane gasoline, is almost



90% water by weight!* Refiners found the dehydrating methods they were using were far too expensive and slow. So they dumped their drying problem into Hersey's lap.

Months of careful analysis and testing in the laboratory bore fruit and the first of many Hersey Silica Gel Dryers was born. Working in two stages, these dryers first bring the free water content (wet basis) from 80.3% down to 50%. In the second stage, drying is completed as the total volatile is reduced to 3%.

Result: Faster, more efficient drying, nearly 80% cheaper than the old method . . . greater fuel economy . . . lower initial equipment cost.

For a successful solution to your drying problem, call on Hersey. No obligation for a consultation—write or wire today.

*As it comes from the filter press.

hersey

E & SECOND STREETS SO. BOSTON, MASS. CONVENTION PAPERS, CORT. . .

other historical causes of depressions. The difficulty is that with each new depression threat, new problems arise to plague the economy. One such troublesome factor today is the high break-even point for many businesses caused by high wages and high material costs that are pricing some firms right out of the market. This situation carries the dangerous seeds of widespread lay-offs and the snow-balling of unemployment.

A second hazardous factor in today's economy is the high degree of reliance that the government is placing on its ability to prevent a depression by economic planning and control. Business is apprehensive as to whether these controls will really save us as things tighten up.

The action of Congress, the administration, and Russia will have a lot to do with the creation of a healthy climate for business in the next few months. If things settle down, our readjustment period could be short and we might well emerge on a plateau of prosperity even before the year is out.

If, on the other hand, our economy continues to churn around under Washington tampering, our current buyer's strike could assume the proportions of a major dislocation. What business needs most today is greater certainty about the course of political events. Even if the news is bad, it would be helpful for business to know it, so as to be able to go ahead and plan on a constructive basis.

A prolonged depression at this time is not necessary if the people of this country can be made to understand that our economic welfare depends on industrial productivity and are willing to support a government policy that will encourage industry rather than hamper it.

On the brighter side in support of the theory that no major collapse is in prospect, there are these favorable factors:

 Farm prices are not likely to collapse in the face of continued government support.

 A return to an industry-crippling labor law does not seem likely. Furthermore, labor efficiency is rising, and only 5 percent of the employable population is unemployed.

 Consumer purchasing power is at a peak, and thus far prices have shown a tendency to recede faster than personal incomes.

4. An abnormally large replacement demand for automobiles still exists and the backlog of housing demand is high. Construction currently is running 4 percent above last year.

5. While the government debt is (Continued)

MORE PYREX BRAND GLASS IN YOUR PLANT PROCESS MEANS

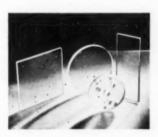
IMPROVED PRODUCT PURITY INCREASED SERVICE LIFE BETTER VISUAL CONTROL EASIER CLEANING

Are you passing up opportunities to reduce overall processing costs? For some time now, process engineers have been expanding the applications for PYREX brand glass No. 7740. Those indicated below are typical.

Having found PYREX pipe a practical plantoperating material over a span of 20 years, they ask themselves, "Why not use PYREX brand glass in other ways?" Putting it up to Corning engineers, they have discovered that it can be made into almost an endless variety of designs by combining flat PYREX brand glass with tubing, cylinders and Corning Multiform glass.

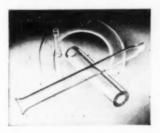
Hence, if corrosion is causing excessive equipment or product losses, check the possibilities of using PYREX brand glass in your plant processes. Highly resistant to acids and mild alkalies, PYREX brand glass gives you maximum service life. Its low expansion coefficient makes it practical where wide temperature variations apply. Its hard surface resists physical shock. Bulletin EB-1, which highlights glass designs that are practical for plant process work, is available free on request.

THESE BASIC PYREX PRODUCTS MAKE POSSIBLE MANY EQUIPMENT DESIGNS



Flat Glass—Sight windows, protective screens, fume hoods, corrosion resistant working surfaces, flat gauges, etc. Cylinders, open or closed ends— Reaction vessels, fractionating columns, sight glasses, plating baths, combustion chambers.





Tubing — Vent tubes, molds, liquid feed tubes, overflow tubes, orifice flow indicators, pressure indicators, etc. Multiform glass parts — Bubble caps, induction furnace jigs, pulleys, guides, firing trays, crucibles.





PLANT EQUIPMENT SALES DEPARTMENT



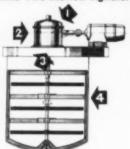
CORNING GLASS WORKS, CORNING, N. Y.



Put a Nettco Engineered Agitator on the job and end your agitating troubles! Nettco drives are built to "take it": housings, bearings, gears, and shafts are conservatively rated to insure hard-working dependability on the toughest services. By combining the correct drive with proper stirrers our engineers make sure the Nettco installation conserves valuable processing time and is easy on the operating pocketbook as well. Stratification, viscosity, tank size, baffle and stirrer design, -and other factors-ore fully evaluated in the light of years of agitation engineering by Nettco. That's why it pays to buy Nettco.

Write for engineering recommendations,

Nettco Two-Motion Agitator



- 1. New Nettco two-motion Duplex Drive.
- 2. Fully lubricated for quiet, dependable operation.
- 3. Positive, leak-proof design -- no stuffing aland.
- 4. Two-directional stirrer ideal for viscous

NEW ENGLAND TANK & TOWER CO.

CONVENTION PAPERS, cont. . .

heavy, the private debt structure is in good shape.

6. Inventory accumulations are not excessive.

The government is prepared to supplement the slack in industrial activity with a public works program.

David E. Faville, Stanford University, before Stanford Alumni Conference, Stanford, Calif., May 14, 1949.

FOREIGN LITERATURE ABSTRACTS

Brazilian Ferrometallurgy

Production of ferrous products in Brazil in the last ten years has increased considerably, as shown in the accompanying tables.

Year		Pig Iron	Steel	Laminate
1938		122,353	93,420	85,666
1939		169,016	114,095	100,596
1940	******	185,670	141,201	135,293
1941		208,795	155,357	149,928
1942		207,750	160,139	155,063
1943		247,680	185,621	157,620
1944		292,169	221,188	166,534
1945		259,909	205,935	165,865
1946		369,254	342,613	230,229

1947	******	480,638	388,024	315,773

Digest from "Ferrometallurgy, National Production in the Decade of 1938-47." Roletim do Conselho Federal de Comercio Exterior XI, No. 5, p. 5-6, 1948. (Published in Brazil.)

Cottonseed Hull Carbohydrates

Cottonseed hulls are a waste product from oil mills and represents 40-

45 percent of the total seed. Their chief use at present is for cattle feed although they could be valuable as a raw material for industrial purposes. They contain from 68 to 75 percent carbohydrates, about 30 percent of which give furfurol and methyl furfurol (pentosans, methyl pentosans, polyuronides) and about 40 percent of which yield cellulose. The nature of these carbohydrates and their reaction to acid hydrolysis must be established if they are to be used in Multistage the hydrolysis industry. hydrolysis of cottonseed hulls brought out a number of facts: increase in the content of delint (residual fibers) in the hulls make hydrolysis more diffi-Hulls containing 16 percent delint hydrolyze completely in nine stages with a maximum yield of hexose sugars at 170 deg.; hulls containing 25 percent delint hydrolyze com-(Continued)



DRYERS - DRYERS - DRYERS

STANDARD Rotary dryers are used throughout the world. STANDARD dryers are competently engineered and stardily built in a wide variety of types and sizes for drying various products, such as fish meal, qurbage, tankage.

humus. fertiliser, sewage, sludge, agricultural products and countless chemicals. Stock designs available in sizes of 2 feet to 10 feet diameters. Let our engineers help you with your prolems—regardless of your location.

We welcome your inquiries.

STANDARD STEEL CORPORATION

Engineers—Manufacturers

5005 Boyle Avenue

Los Angeles, Cal.



the De Laval single inlet blower

A RUGGED BLOWER FOR HARD SERVICES CASE SCIENT THE SIGN OF THE SERVICES CASE SCIENT THE SERVICES

DE LAVAL

STEAM TURBINE CO.

This De Laval blower has been designed and constructed to meet the most exacting service with the utmost reliability and efficiency. The heavy, cast casing is smoothly finished and scientifically contoured. The vanes of the built-up forged steel impeller are curved to assure stable flow characteristics. A Kingsbury type thrust bearing is employed in place of ball or collar type thrust bearings. The sleeve type bearings in the pedestal are pressure lubricated. The case rings are replaceable. The discharge opening may be positioned at any angle in 15° increments for either direction of rotation.

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CHEMICAL ENGINEERING-July 1949

285

The smooth, tough surface of electrodeposited LEKTROMESH...

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the great uniformity of hole size—the wide range of commercial "mesh" sizes (25 to 400)—the valuable ductility and the tensile strength of 50,000 to 100,000 psi—and the fact that it can be stamped, cut, drawn and even scraped without distortion of its mesh, all make

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NEED ideal for precision filtration when you need pure nickel, pure copper, or a combination of copper-nickel.

Write Department 15

PRECISION FILTERS?



Stainless Steel "Sanitary" Valve Type - DJQ his particular ASCO Solenoid Valve is ideal for controlling the flow of material in connection with batching operations.
Coupled with its "cleanability" feature is its reliability. Fully automatic, it opens and stays open as long as the call is energized; it closes and stays closed when it is de-energized. Several pipe sizes available. Write us about your automatic central problem in connection with the flow of liquids or gases, mentioning size of pipe, nature of materials and pressure. If this valve doesn't fit the picture, we have scores of other designs from which to select. When in need of Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and Specialized Electromagnetic Controls, come to us.

Automatic Switch Co.

FOREIGN ABSTRACTS, cont. . .

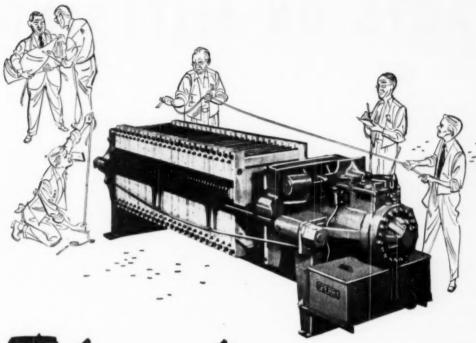
pletely only in ten stages and with a maximum yield of hexose sugars at 180 deg. Increase in the concentration of sulphuric acid in the solution during hydrolysis does not give an increase in the yields of reducing sub-stances. Most of the easily hydrolyzable carbohydrates (hemicelluloses) hydrolize at 120-130 deg. Most of the cellulose hydrolyzes at 170-180 deg. Zylan, araban, rhamnan and polyuronides are the easily hydrolyzed carbohydrates of cottonseed hulls; mannan and cellulose are the ones which are difficult to hydrolyze. The easily hydrolyzed carbohydrates yield 87-97 percent of the possible yield of sugars on hydrolysis, where as the difficult to hydrolyze carbohydrates give yields of 56.3—61.7 percent.

Digest from "Investigation of the Carbohydrates of Cottonseed Hulis by the Method of Multistage Hydrolysis" by V. G. Panasiuk and L. V. Podobaeva, Zhurmal Prekladnot Khimi XXII. No. 2, p. 114-155, 1948. (Published in Russia.)

Hardenability of Polycondensation Resins

Hardenable compounds, such as resins, are very stable as such, but they can be made to condense further under specific conditions and thus be converted to higher-molecular, insoluble and non-melting products. Carrying out this process raises several questions. Why and how can the condensation be intercepted as compared with other similar processes? On what does the second part of this divided process, the hardening, depend? This is usually accomplished by the action of heat or by the addition of strong acids. It appears that the proton affinity of oxygen or nitrogen atoms in polycondensation products of the type described in this article brings about a mutual reaction of polyfunctional reaction partners. This proton affinity, however, can also cause the formation of intramolecular proton bonds, which again results in a more or less extensive stabilization of intermediate products containing methylol These cases, of course, are groups. possible only under specific conditions, and the resulting products condense further on dissolving of the proton bonds by application of heat or addi-tion of hydrogen ions. They can therefore be designated as self-hardening. The proton bonds undoubtedly play an important role in the stability of dimethylene-ether bonds too, which take part in the synthesis of this type

Digest from "Theory of Hardenability of Polycondensation Resins" by K. Hultzch, Augereandte Chemie 61, No. 3, p. 93-94, 1949. (Published in Germany.) —End



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Most Sperry Filter Presses are made to order . . . especially designed to fit your particular requirements. With more than 50 years experience and using advanced techniques, Sperry can determine scientifically the type and amount of filtration equipment you need. The result is lower operating costs and greater production efficiency.

The Sperry Plate Filter Press is available in a wide range of materials and sizes. And, because of its many advantages - such as low initial cost, ease of operation, flexibility in use, and uniformity of product - it has become the most widely used filter today.

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FACTS ON FILTERING

Representative case histories on widely varied clarification problems condensed from field reports of Johns-Manville Filtration Engineers

Solves Filter Problem in new Cotton Seed Oil Solvent Extraction Plant



(reported by J.M. NEW ORLEANS DISTRICT: I had an emergency call from one of my customers whose new filtration unit was not working.

and as a result, his solvent plant was shut down. This unit for the solvent extraction of cotton seed oil had only been run two or three hours on separate trials. The filters were only precoated, and after thirty minutes would build pressure up to 45 lb. and stop.

Before we started trial runs, I had them install a small screw dry feeder on top of the precoat tank, and directed the unfiltered oil stream into the top of this tank so that we could have continuous filter aid feed. We precoated one filter with Hyflo at 5 lb. pressure and started the feed.

We filtered 2,500 gal, the first hour and got away ahead of the centrifuge, and for the next hour we recycled from the precoat tank. We started the filter at 10:30 A.M. and filtered for 15 hour, then recycled and finally shut the filter down at 11:30 P.M. At no time did the pressure go over 20 lb. and we had no trouble at all. We used 50 lb. of powder for 7,500 gal, of extract.

Pressure Changes Affect Clarity in Gelatin

(reported by J-M Eng. W. A. Reschke) CHICAGO DIS-TRICT: While making a call on one of my customers, I learned that they were experiencing clarity difficul-



ties with their gelatin filtration. While setting up our field test unit.

at the filters. We quickly checked and noted a 20 lb, rise and fall due to the steam duplex pump in use.

their chemist mentioned that previously he had observed fluctuating pressures How to get help with your Filtration Problems

If you have a filtration problem of any kind, call in a Johns-Manville Filtration Engineer. Technically trained and thoroughly experienced, he can probably help you find the solution. He may find that a slight change in equipment, operating technique, method of adding filter aid-or a change to one of the high-speed Celite Filter Aids will increase production without affecting filtrate quality. A check-up of your filtering methods will cost you nothing and may save you money. Just address Johns-Manville, Box 290, New York 16, N. Y.

I explained how pressure change would affect clarity and demonstrated this on the test unit as follows:

The filter was precoated with a mixture of Celite 505 and Standard Super-Cel (same ratio as they were using) and after 3 minutes of recirculation, switched to unfiltered gelatin. The clarity of filtrate was judged to surpass the regular product.

Then by opening and closing the bypass I showed the effect of fluctuating pressure on clarity. The filtrate came out cloudy. The filter was then allowed to run normally and the clarity again became excellent. Suggested that insertion of a surge chamber (814 in. dia. 24 in. long) in the line would minimize surges set up by their steam duplex pump.

Get 80 lb. Improved Yield on 3000 lb. Batch of Beeswax



Eng. W. J. Bucklee) PHILADELPHIA DISTRICT: Following a suggestion of mine. a wax products manufacturer made a trial run on filtering

African beeswax, using both carbon and a bleaching clay as decoloring agents, and the addition of 15 lb. of Celite 503 on a 3000 lb. batch of the wax. The test

was very satisfactory and the work will be continued along these lines.

Of particular interest was their report that 80 lb. of wax was recovered in blowing the press. They attributed this saving to Celite 503 which permitted easier blowing due to the increased porosity of the filter cake.

Perfect Clarity Established in a **Few Minutes**

(reported by J-M Eng. P. R. Deachere)

NEW YORK DIS-TRICT: This company filters cider, They had been precoating



from a barrel but, after precoating, they had changed connections to run from a 5000 gallon tank without additional filter aid. Although the filter had operated for several days, they had not been able to obtain continued clarity.

A check of the system showed that a booster pump was creating a suction in back of the filter cloths. We removed the pump from the outlet line and discharged directly from the filter to the bottling tank. The bottles received brilliantly clear cider.

By adding 132 lb. of Hyflo to the filter supply barrel every 10 minutes, it was possible to maintain operations over a long period and keep well ahead of the bottling machine.

Johns-Manville **Celite** Filter Aids

Chemical Engineer's Bookshelf

LESTER B. POPE, Assistanti Edito.

Impressive

1949 MODERN PLASTICS ENCYCLOPEDIA. Breskin Publications, New York. 1,370 pages. \$5.

Reviewed by Roger Williams, Jr.

The new Modern Plastics Encyclopedia is, like its predecessors, a compendium of plastics information. As a reference book, it belongs on the bookshelf of any engineer who



works on or with plastics and who must keep abreast of progress.

There is little change in this year's edition, but the sections on new developments which head each chapter are valuable reading. They indicate, perhaps better than anything else, the continuing growth of the plastics industry.

One section of the encyclopedia which gets little review attention deserves comment. That is the section at the end of the book listing companies, personnel, tradenames, and other information about those in the industry. To the current or potential plastics user, such lists can be very worthwhile. The lists are complete and up-to-date. Like any such major undertaking, they contain minor errors (for instance, nylon is included in the list of registered tradenames with an asterisk that does not lead to anything). But these errors are too minor to harm the basic value of the lists.

As usual, this reviewer has to conclude with his annual plea—bind the encyclopedia in more than one volume. A book of 1,370 pages is just too heavy for the constant use the contents deserve.

Constituents

THE ESSENTIAL OILS, VOL. II. BY Ernest Guenther and Darrell Althausen. D. Van Nostrand Co., New York. 852 pages. \$10.

Reviewed by Edward Sagarin

By this time the work of Dr. Guenther on essential oils is so well known and held in such high repute that a new volume in his monumental series calls more for an announcement than for an evaluation. It can already be seen that the series, of which this comprises the second volume, will unquestionably replace all previous works as the standard reference of the subirect.

The present volume is devoted to the constitutents of essential oils and it is naturally divided according to chemical structure rather than botanical origin. To these constituents, Dr. Guenther has chosen to add a few materials that are structurally closely related to substances found in essential oils although such materials may not be known in nature. In this volume, the chemist will find useful summaries of data covering well-known essential oil constituents that are frequently employed in perfume and allied industries, but perhaps equally useful will be the information, usually obscure and difficult to obtain, on a large number of constituents that are rather little

The presentation of the material will open interesting possibilities for the study of the odor relationship, and the reoccurrence in botanically similar products, of substances having related chemical structures.

It can be said without reservation that this book is indispensable to all those whose interests are focused in any way on essential oils.

Directory of Directories

Sources of Engineering Information. By Blanche H. Dalton. University of California Press. Berkeley. 109 pages. \$4.

Here engineers are offered a guidepost to the most direct route to

RECENT BOOKS RECEIVED

Monomers, Section I. By E. R. Blout, W. P. Hohenstein & H. Mark. Interscience. \$7.50.

Quantitative Organic Analysis via Functional Groups. By S. Siggia. Wiley. \$3.

Statistical Methods in Research and Production. 2nd ed. By O. L. Davies. Oliver and Boyd (London). 28s.

Sugar, Its Production, Technology and Uses. By A. Van Hook. Ronald Press. \$3.

Glycerine and Some Glycerine Derivatives.
Association of American Soap & Glycerine
Producers. \$2.50.

Ultrasonics. By B. Carlin. McGraw-Hill. \$5.

printed material on a given subject. The directories are first grouped as to general type such as abstracts, bibliographies, trade catalogs. When necessary these groups are further divided—listed under abstracts, for instance, are the titles: Digests in Journal, and Indexes with Annotations; Abstract Sections in Journals; Abstracts in Monographs. Engineering fields covered include aeronautics, electronics, illumination, metals and metallurgy, materials testing, ventilation, hydromechanics, electrical, mechanical, mining and civil engineering.—FA

Compact

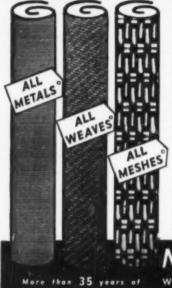
PATENT LAW. Second edition. By Chester H. Biesterfield. John Wiley & Sons, New York. 267 pages. \$4.

Reviewed by Paul W. Garbo

The preface states that it has been the author's endeavor to present a volume on the patent law that fulfills three purposes: first, a volume of modest size; second, a text that presents the basic principles of the substantive patent law in terms that the general reader will be able to understand; and third, a careful selection from the leading decisions in support of these principles. It seems to the reviewer that the author has succeeded in covering a generous scope of subject matter pertinent to patents within the confines of a volume of modest and handy size. Similarly, the author has well documented his work with decisions of the U.S. Supreme Court and the federal courts of appeal.

Successful attainment of these two purposes appears to have handicapped the author, at least in the early chapters of his book, in writing a text which discusses patent law "in terms that the general reader will be able to understand." The author frequently discusses his subject in professional terms which are familiar to patent attorneys and others who have had fairly close contacts with patent mat-ters. The use of legal lingo doubtless effects economy of paginal space but it must be realized that such economy sacrifices clarity to the general reader who may be venturing into his first study of patent law. To illustrate, researchers, chemists, engineers and in-(Continued)

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service to process industries

BY THE PIECE. YARD AND ROLL

There is a very definite reason why Multi-Metal wire and filter cloths have served so well in the process industries. It is the fact that Multi-Metal products are made to rigid standards of quality. both as to accuracy of design and metallurgical properties. As a result, Multi-Metal wire and filter cloth step up processing operations - reduce cleaning and repairing shutdowns - increase production capacity.

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Reports on the remarkable performance of the Abbé Turbo Sifter show exceptional output with savings of as much as 80 per cent in time and labor.

Employing the centrifugal separation principle, this Sifter eliminates shaking, vibration, air separation, loss or contamination. It is quiet and dustproof.

The Abbé Turbo Sifter costs little to install and operate, as proved in many hundreds of plants. Let Catalog 65 tell you why.



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Books, cont. . . .

ventors to whom the book is avowedly addressed should find difficulty in understanding terse statements like that on p. 45 to the effect that a patent application may be abandoned "by action under Rules 96, 107, 109, and 125," particularly when the book fails

to explain these rules.

Approximately the first half of the volume is devoted to such basic topics as invention and discovery, novelty, priority of invention, originality, claims, and the patent application and its prosecution. Since these topics are usually the closest to the interests of researchers and inventors, the author might have advantageously given them a somewhat more detailed treatment with a less legalistic style. The second half of the book deals with the more unusual (to researchers and inventors) patent problems like interferences, infringement, licenses and patent litigation. The reviewer is satisfied that the latter chapters are largely free of the criticisms leveled against the opening chapters.

All in all, the author has turned

out a compact volume on patent law which should prove most interesting and valuable not to the average researcher or inventor nor to the experienced patent attorney but to novice patent attorneys and others like research directors and executives who have fairly frequent encounters with

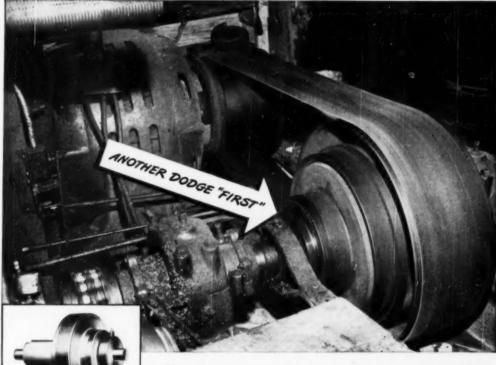
patent problems.

Practical Techniques

BIOCHEMICAL PREPARATIONS. VOL. I. By Herbert E. Carter, John Wiley & Sons, New York, 76 pages, \$2.50,

Biochemical compounds, not readily available commercially and which can be made from available starting material, will be treated in this series. It will include techniques of general application in preparative work. Although the editors plan to emphasize isolation methods, they will publish synthetic methods whenever the compound is best obtained by synthesis.

Each entry contains five sections: principle; starting materials; procedure; properties and purity of product; methods of preparation. The principle is a short statement summing up the process. Suitable starting materials are next discussed with instructions as to how or where they may best be obtained. The procedure is a step-by-step account of the preparation; equipment is fully described and the range of yields is given. The section on properties and purity of product indicates necessary precautions in experimental procedure and in evaluating the purity of the final product. The meth-



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takes the tremendous shock loads of a veneer peeler lathe. Huge logs are revolved and "peeled" by knives, with 150 to 200 engagements per hour! Precision-built clutches, capable of performing dependably where profits depend upon uninterrupted operation, are an-

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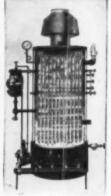




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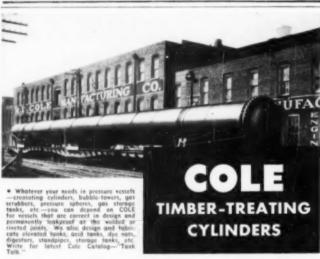
Engineered steam at its best with four decades of experience at your disposal—so, send your steam problem to us for study and recommendation.

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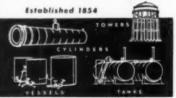
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FOUR DECADES OF AUTOMATIC GAS-FIRED BOILER MANUFACTURING EXPERIENCE







Books, cont . . .

ods of preparation section lists alternate preparations with references to footnotes giving published source material.

This first volume contains 16 preparations including those of casein, L-glutamine, lycopene and lysozyme. The editors plan to publish a volume every 12 to 16 months .- FA

Mathematics

PRACTICAL ANALYSIS. By F. A. Waters. Translated by Robert T. Beyer. Dover Publications, New York. 422 pages. \$6.

What kind of analysis is Dr. Willers interested in? Not chemical, but 'graphical and numerical methods"that's the subtitle. Actually it's pretty heavy going. The book is mentioned in these columns for those mathematically inclined readers interested in interpolation formulas, analysis of empirical functions, interpolation, and numerical-calculation and its aids. For them it is to be "recommended as a convenient reference book."-LBP

Recent Books & **Pamphlets**

Soybean Blue Book. Published by the American Soybean Association, Hudson, Iowa, 132 pages, St. Statistical infor-mation on past production and prices of Soybeans, soybean oil and oil meal and on utilization of these products.

Sugar and Sugar By-Products in the Plastics Industry. By Louis Long, Jr. Technological Report Series No. 5, re-vised edition of Scientific Report No. 1, published by Sugar Research Founda-tion, Inc., 52 Wall St., New York, N. Y. 66 pages. Gratis.

Current Trends in Social Insurance Legislation. By Harry G. Waltner, Jr. Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh, Pa. 10 pages. Gratis. Discusses developments in the field of social security in the last two decades.

The Utilization of Sucrose by the Mammalian Organism. By Walter W. Wainio, Scientific Report Series No. 12, published by the Sugar Research Foundation, Inc., 52 Wall St., New York, N. Y. 45 pages. Gratis. Summary of the extensive research done on sucrose metabolism.

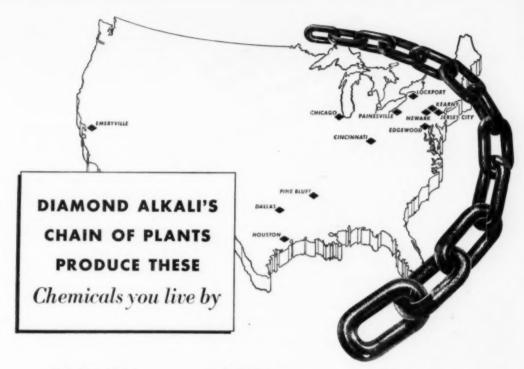
Isotopes and Their Application in the Field of Industrial Materials. By Paul C. Aebersold, Published by American Society for Testing Materials, 1916 Race St. Philadelphia 3, Pa. 28 pages, \$1, Includes comment on useful atomic power, induction of chemical and physical effects and applications of radioactive and stable isotopes.

A National Oil Policy for the United States. National Petroleum Council, 1625 K St., N.W., Washington, D. C. 28 pages. Lists aims, principles and ele-ments of the policy.

andex to A.S.T.M. Standards. Published by American Society for Testing Mate-rials, 1916 Race St., Philadelphia 3. Fa. 264 pages, Latest index, as of December 1948, to specifications, methods of test-or terms, charts and tables. Includes a list of titles in numeric sequence of all ASTM serial designations.

ASTM serial designs of the Period 1939-1945. British Intelligence. Objectives Sub-Objective Sub-Object by His Amjesty's Stationery Office, Incode, England (Continued)

July 1949-CHEMICAL ENGINEERING



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Books, cont. . . .

land. 24 pages. 20 cents. Includes data on size and condition of the industry, processing of jute and of alternatives, factory and mill equipment, etc.

The Film in Industrial Safety Training. By Paul R. Ignatius. Published by Division of Research, Graduate School of Business Administration, Harvard University, Soldiers Field, Boston, Mass. 119 pages. \$1.50. Evaluates the effectiveness of safety films, discusses what has been done with them and what may be done.

"... The Most Desirable Personal Characteristics..." Published by Engineers' Council for Professional Development, 29 West 35th St., New York 18, N. Y. 25 pages, 25 cents. Presents and reports on the trial use of a questionnaire on the relative importance of various personality traits in the business world.

The Utilization of Sugar Cane Bagasse for Paper, Board, Plastics, and Chemicals. By Clarence J. West. Scientific Report Series Supplement to No. 3, published by Sugar Research Foundation, 52 Wall St., New York, N. Y. 20 pages. Gratis. An annotated bibliography.

Sixteenth Annual Report, Engineers' Council for Professional Development, Published by Engineers' Council for Professional Development, 29 West 33th St., New York 18, N. Y. 40 pages. Contains the council's charter and rules of procedure, committee reports, and lists proceeding development, and institute curricula.

Research at Illinois. Published by the University of Illinois, 258 Administration Bidg. Urbana, Ill. 48 pages. With photographs and brief descriptions, this booklet surveys the research being done on the Illinois campus. It covers the physical world. He processes, technology and human behavior.

Welding Metallurgy, Second edition. By O. H. Henry and G. E. Claussen, revised by G. E. Linnert. Fublished by the American Welding Society, 23 West 29th St., New York 18, N. Y. 595 pages, \$2.50, General principles are emphasized in this text, with discussions centering on steels or ferrous alloys.

Research on a Single Reaction and Its Social Effects. By Robert E. Wilson. Third Annual Arthur Pehon Little Memorial Lecture, published by the Massachusetts Institute of Technology, Cambridge, Mass. 26 pages. Discussion of petroleum cracking.

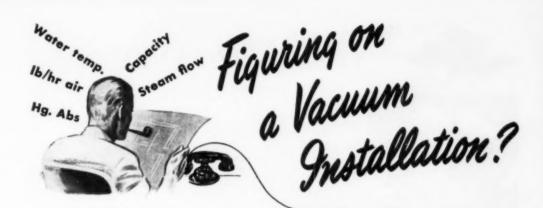
Bibliography of Electro-Organic Chemistry, Part I. By Sherlock Swam, Jr. Engineering Experiment States of the Engineering States of Engineering Engineering States of Engineering Sta

Ron-Pressure Treatments of Round Rorthern White Cedar Timbers With Creosote. By Everett E. Kins. Engineering Experiment Station Bulletin Series No. 278, published by the University of Illinois, 258 Administration Ridg., Urhans, III. 62 pages, 20 cents. Outlines a series of tests.

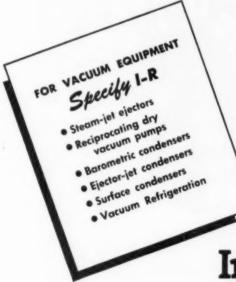
An Investigation of Creep, Practure, and Bending of Lead and Lead Alloys for Cable Sheathing—Series 1946. By Curtis W. Dollins, Engineering Experiment Station Bulletin Series No. 278, published by the University of Illinois, 258 Administration Bilds. Urbana, Ill. 90 pages, 50 cents. Results of creep tests on strips and full sections of lead cable on strips and full sections of lead cable applications of the research.

Standard Welding Terms and Their Definitions. Published by the American Welding Society, 33 West 29th St., New York 18, N. Y. 50 pages, \$1. Defines over 500 terms.

Waster Chart of Welding Processes and Process Charts. Fublished by the American Welding Society, 22 West 29th St., New York 18, New York 19, New Yor



Then here's a suggestion: There is an engineer in every Ingersoll-Rand branch office who is a specialist in the application of vacuum equipment. Why not give him a call? See what he has to say about your particular vacuum problem. He is convenient to you and is thoroughly qualified by years of experience to recommend vacuum equipment that will give you the most economical results dependent upon plant conditions. Chances are, the equipment best suited to your needs can be selected from the complete range of standard Ingersoll-Rand ejectors. Should it call for a specially engineered selection, then the full scale engineering and research facilities of Ingersoll-Rand will go to work on your problem.





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Steamer Bucket



GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. In ordering any publications noted in this list always give complete title and issuing office. Remittance should be made by postal money order, coupons, or check. Do not send postage stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, the pamphlet is free and should be ordered from the bureau responsible for its issue.

Strength and Creep Characteristics of Ceramic Bodies at Elevated Temperatures. By M. D. Burdick, et al. National Advisory Committee for Aeronautics, Washington. D. C. Technical Note No. 1561. A resume of over 100 tests made at the Bureau of Standards to evaluate certain oxide materials for high temperature application, such as turbine blades.

Synthetic Organic Chemicais. United States Production and Sales, 1947. U. S. Tariff Commission. Report No. 162, second series. Price 45 cents. A complete statistical auminary of the annual survey giving production and marketing data for each individual chemical for which statistics can be published.

Control of Foaming by Adding Known Mixtures of Pure Chemicals. By J. W. McBain, et al. National Advisory Committee for Aeronautics. Mashington, D. C. Technical Note No. 1842. Describes methods of testing different chemicals capable of inhibiting foam.

Attempts to Defoam Existing Oils by Processing. By J. W. McBain, et al. National Advisory Committee for Aeronautics, Washington, D. C. Technical Note No. 1845. Experimental study of charcoal column recycling to defoam lubricating oil.

Steam-Electric Plant Construction Cost and Annual Production Expenses. Federal Power Commission, Washington 25, D. C. No. FPC-8-72. Copies may be obtained from Pederal Power Commission for \$3 each A compliation from annual reports and power system statements filed with the Pederal Power Commission by electric utili-

Developing & Selling New Products. By Gustav E Larson. Department of Commerce. Price 25 cents. A guidebook for manufacturers intended to "reduce the risk involved in the development and sale of new products."

Report of the President's Commission on Labor Relations in the Atomic Energy Installations. U. 8. Atomic Energy Commission. April 1949. A aummary of recommendations for stability in labor relations at Atomic Energy Commission plants.

Regional Census Data, preliminary mimeographed reports. Bureau of Census. "Summary Statistics for States and Major Industry Groups" provides general data for the United States as a whole. Nine regional "Preliminary Reports" give major industry figures by groups for nine resions. Commodity reports are, in general, not available, though general statistics can be had.

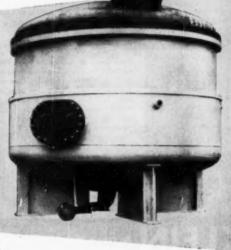
Abstracts of Patents Granted. Bureau of Agricultural and Industrial Chemistry. AIC-230. A mimeographed abstract of patents granted to members of the staff of North-

(Continued)



NICKEL keeps the product pure in gelatin processing in gelatin processing





Jacketed pressure vessels, made of Nickel-Clad Steel, used in the extraction of geletin. The vessels were designed in accordance with the ASME code for pressure vessels, Per U-69. The entire plant was designed and built by ARTISAN METAL PRODUCTS, INC., Boston, Mass.

Gelatin...essential to modern photography and favorite edible of millions...must be pure to meet today's exacting standards.

For many applications, including photography, even a slight amount of metallic contamination cannot be tolerated in gelatin. To further complicate production problems, gelatin is highly susceptible to contamination from metal vessels and processing equipment.

Large producers of gelatin have reduced metal pickup to a negligible amount by using Nickel and Lukens Nickel-Clad Steel for processing tanks, evaporators, and pressure vessels. Nickel is highly corrosion-resistant and protects gelatin from harmful metallic contamination.

In the most recently built gelatin plant, Nickel and Nickel alloys were used throughout, wherever metal surfaces were in contact with the gelatin.

Inconel Solves Still Another Problem

In the production of sheet gelatin, a water solution is flowed over metal drying nets stretched on wooden frames. The nets are then stacked, and warm air is blown over them to drive off water.

When dry, the gelatin is dumped off the nets. If the sheet adheres, the net fabric is struck with a leather thong...and here is where a maintenance problem developed.

Repeated striking stretches ordinary netting and causes eventual failure. Nets made of strong, corrosionresistant Inconel solved the problem and have been in use for more than ten years ... outlasting previous net materials many times.

If you have metal problems involving corrosion, product contamination, or thermal durability, consult Inco's Technical Service Department.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street, New York S. N. Y.

USE PURE WHERE PURITY COUNTS



Solid Inconel tanks used in first stage of producing edible gelatin. Tanks are 42" O.D. with 's" wall. Covers are flanged and ducts are 4" I.P.S. Inconel Pipe Bends. Febricated by AR-TISAN METAL PRODUCTS, INC., Boston, Mass.

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POSITIVE FILTRATION - NO CLOGGING
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Klein Ideal Diatomaceous Earth Filters and the exclusive Klein Filter Leaves, in combination, assure positive filtration at all times. Operation, cleaning and maintenance costs are at a minimum with

Klein Filters. In addition, many radical innovations are incorporated in Klein Ideal Filters. You'll want to know about all of these if you have an industrial, chemical or food filtration problem in your plant.



Klein Filter Leaf—if damaged, metal dath easily replaced. No rivets. Note horizontal headers—central duct—Klein Cleanout Cap.



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FILTER & MANUFACTURING COMPANY

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GOVT. PUBS., cont. . .

ern Regional Research Laboratory, Peoria, Ill., between June 1943 and December 1948. Brief paragraphs describe over 40 patents, which have been assigned to the public, resulting from various types of investigations.

Agricultural Gutlook Charts—1848. Bureau of Agricultural Economics. October 1948. Price & Aproximately 80 and a supervised of the Agricultural Economics of Agricultural Economics. Agricultural Economics of Agricultural Economics of Agricultural Economics of Agricultural Foducts. Of chemical Interest from the standpoint of markets for chemicals and of supply of such raw materials as fats and oils.

Eastern Regional Research Laboratory, By P. A. Wella. Bureau of Agricultural & Industrial Chemistry. AIC-227. Available from Eastern Regional Research Laboratory, Chestnut Hill Station, Philadelphia 18, Pa. Outlines various research projects and policies for industry cooperation.

Market Diseases of Fruits and Vegetables—Potatoes. By G. B. Ramaey, et al. Dept. of Agriculture. Miscellaneous Publication No. 98.

Tests on the Ignition of Natural Gas-Air Mixtures by Permissible Explosives in the Experimental Coal Mine. By H. P. Greenwald, et al. Bureau of Mines, Technical Paper 716. Price 15 cents.

Preliminary Ceramic Tests of Clays From Seven Pacific Northwest Deposits. By K O. Skinner and H. J. Kelly, Bureau of Mines, Report of Investigations R. I. 4449 Mimeographed.

Survey of Commercial Aviation-Gasoline Characteristics, January 1949 Production. By W. C. Holliman, et al. Bureau of Mines, Report of Investigations R. I. 4529. Mimeographed.

A Method for the Spectrochemical Determination of Thallium in Ores, Concentrates, Busts, and Chemicals. By G. W. Marks and E. V. Potter. Bureau of Mines, Report of Investigations R. I. 4461. Mimeographed.

Safeguarding Underground Workmen From Noxious Gases Resulting from Blasting in Strip Mines. By E. H. McClearet al. Bureau of Mines, Information Circular I. C. 7303. Mimeographed.

Investigation of the Lander Phosphate Rock Deposits, Fremont County, Wvo. By W. H. King and J. I. Schumacker. Bureau of Mines, Report of Investigations R. I. 4437. Mimographed.

Energy Resources of the Werld. Department of State, Washington, D. C. 1949. Price \$2.25. A geographical survey of the origin and utilization of energy in 1937, with supplementary data for 1946 and 1946, and an examination of energy prospects for the future.

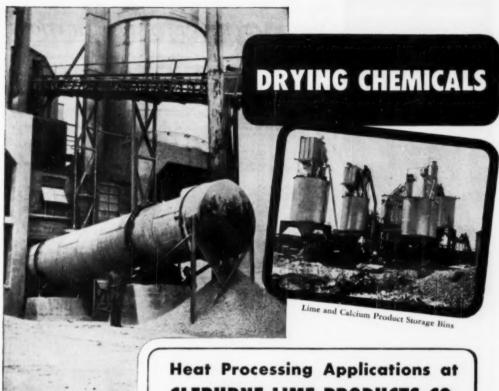
Alcohol Data. Annual Report of the Commissioner of Internal Revenue. For the fiscal year ended June 30, 1946. Price 45 cents. Includes the very detailed data on alcoholic beverages and industrial alcohol as customary in this administrative and technical-record document.

Program for Disposal of the Governmentovered Rubber-Producing Facilities. Unnumbered document of Reconstruction Finance Corporation. A report to the President and to Congress summarizing the present status of the governmentowned properties and proposing a program for disposal of the remaining facilities which are still government-owned. The Report was submitted formally by RFC. Agency Disposal Committee which assisted the Rubber Reserve Division in formulating a program believed to be generally acceptable to all interested government agencies.

ECA and Strategic Materials. Senate Report No. 149, 81st Congress. Outlines world relations in securing essential, critical, and strategic materials as influenced by CCA.

Federal Specifications Index. Bureau of Federal Supply. Price 40 cents. The current list of Federal Specifications which constitutes Section IV of the Federal Standard Stock Catalog is available in a booklet revised to Jan. 1, 1949.

-END



Gas-fired dryer for calcium being checked by Supt. John L. Carlyle.

CLEBURNE LIME PRODUCTS CO. Illustrate Versatility of GAS

HEAT PROCESSING, in the manufacture of lime products, requires the wide temperature range and equipment flexibility so readily possible with the productive flames of GAS. That's why Superintendent J. L. Carlyle states, "We wouldn't think of operating this plant if we couldn't get GAS. Other fuels are simply not practical, whereas the controllability and economy of GAS make our operation practical."

Purity of the raw material, which tests at 98.6% lime, makes

it possible for Cleburne Lime Products Company to manufacture high-grade calcium for cattle feed, industrial chemicals and other needs. In addition, lime for fertilizer, purification, and catalytic processes, is being produced in large quantities.

Under the direction of President J. L. Lain, every effort is being made to increase production of high-grade lime derivatives. Effective utilization of GAS in mode ern Gas Equipment is one of the most important steps in the development. Drying of calcium is performed in a Gas-fired rotary kiln, 6 feet in diameter and 40 feet long, operating at 800° F. The calcining of lime is a continuousflow process in which stone enters at the top of the column, moves downward during a 12-14 hour cycle when it is heated to 2600° F.

Controlled heat processing with the productive flames of GAS, in chemical as well as other manufacturing, is the economical and practical way to production-line operation. Call your local Gas Company for details on effective utilization of GAS.



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Combining an electrical contact unit with the standard Niagara Meter for measuring liquid flow, the Niagara Electri-Contact Meter accurately regulates liquid volume for batch mixing. Automatic shutoff is accomplished by means of a solenoid actuated valve—a timesaving operation compared with the measuring-tank method.

Designed for use in the chemical, food and other industries, the Niagara Electri-Contact Meter is available in several models, covering a wide range of capacities. It is also available in stainless steel for metering chemicals.

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MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and industrial executives, manufacturers usually specify that requests be made on business letterheads.

Solids Pumps. Allia-Chalmers Mfg. Co., 1147 South 70th St. Milwaukee, Wis.— 8-page bulletin 68863IC describes construction, design and maintenance features of the eight sizes of solids pumps made by this company. Gives specifications and dimensions.

Cenveyors. Standard Conveyor Co., North St. Paul 9, Minn.—4-page Bulletin No. 220 illustrates and describes the line of portable power belt conveyors made by this company.

Mixers. Entoleter Division, Safety Car Heating and Lighting Co., Inc., P. O. Box 904. New Haven 4. Conn—4-page leafet outlines the construction and operating features of the continuous mixer made by this company.

Cathodic Protection. The Cleveland Heater Co., 2310 Superior Ave., N.E., Cleveland, Ohio.—18-page Educational Bulletin No. EB-104 entitled "Cathodic Protection of Calvanized Hot Water Storage Tanks by use of Galvanize Magnesium Alloy Anodes" by D. J. Fergus. Price is 25 cents.

Silicon-Iron Alleys. The Duriron Co., Inc., Dayton I, Ohio.—12-page Bulletin 113 presents data collected in the last 10 to 15 years on this company's high silicon iron alloys for corrosive services. Lists a number of common corrosives and the tegence which this company's products resist them.

Condensate Control Systems. Cochrane Corp. 17th St. & Allegheny Ave. Philadelphia 32, Pa.—24-page booklet No. 3250 on this company's high pressure condensate return systems. Contains data on steam flow conditions and heat exchange characteristics. The units and their parts are diagrammed.

Chemicals. Koppers Co., Inc., Chemical Division, Pittsburgh 19, Pa—28-page Bulletin C-9-111 describes the physical and chemical properties of beta-methyl unbelliferone which is made by this company. Lists industrial uses.

Radioactive Tracers. Arthur D. Little, Inc., Cambridge 42, Mass.—18-page booklet entitled "A Selected Bibliography on the Industrial Uses of Radioactive Materials."

Chlorinated Biphenyl. Monsanto Chemical Co., St. Louis 4, Mo.—13-page Bulletin No. P-137 describes physical properties and applications of chlorinated biphenyl, the hydraulic fluid for metal die-casting made by this company.

Wire Rope. Macwhyte Co., 2940 Fourteenth Ave., Kenosha, Wis.—8-page pocket-sized flyer containing 20 questions and answers on the wire rope produced by this company.

Burners. Surface Combustion Corp., Toledo I. Ohio.—-page Bulletin SC-142 Pictures and describes the various processes to which this company's burners are adaptable. Data tables show the heat requirements for water in open tanks, both dip and apray types.

Industrial Preservative. Monsanto Chemical Co., St. Louis 4, Mo.—17-page report on the formulation and application of this company's rot and mildew preventative.

(Continued)



Pointers on Pumps

HOW MUCH WILL A CENTRIFUGAL PUMP DELIVER?



The capacity of a constant speed centrifugal pump whose head capacity characteristics (H-Q) are shown in Figure t on any piping system can be determined as follows:

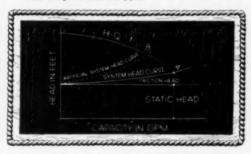


Plot the friction loss through all piping, valves and fittings at different rates of flow. Use any standard friction tables, making allow-onces for age and condition of pipes.



Static Head is the difference between liquid levels in suction and discharge vessels plus the algebraic difference of pressure, between suction and discharge vessels, expressed in feet. Combining the friction head curve at different rotes of flow with the static head gives the system head curve, which is total head in feet."

See method of calculating head described in previous advertisement in this series. We will gladly send you a copy.



When the head capacity curve (Figure 1) is superimposed on the system head curve, (Figure III) the intersecting point "A" is the capacity that will be delivered by the pump on this system. If a smaller capacity is desired, partial closing of the discharge valve will produce an "artificial" system head curve, giving capacity at point "B". Any capacity between point "A" and shut-off (zero capacity) may be obtained by adjusting discharge valve.

ANY OTHER PROBLEMS?

Worthington's engineering department — backed by the longest and broadest experience in the field — will do its best to solve them. Because in addition to making the most complete line of pumps, Worthington makes its technical service fulfill the promise that there's more worth in Worthington...

Contact our nearest District Office, or write to Worthington Pump and

Machinery Corporation, Contrifugal Pump Division, Harrison, N. J.



WORTHINGTON















C9-1

Unbelievable savings in fuel, surprising increase in speed of production, gratifying uniformity of quality, and freedom from the usual troubles attendant on the customary method of condensate removal are the results of the installation of the Cochrane C-B System. Fast, uniform heat, no flash loss, condensate returned to boilers at high temperature and high pressure . . . Write today for a copy of Publication 3250 and learn how you can secure these benefits in your plant . . . Cochrane Corporation, 3113 N. 17th St., Phila. 32, Pa.

SYSTEM OF CONDENSATE DRAINAGE CONTROL

MERS.' PUBS., cont. . .

copper-8-quinolinolate. Gives application methods for protection of textiles, plastic coated fabrics, protective coatings, etc.

Organolithium Compounds. Metalloy Corp. Rand Tower, Minneapolis, Minn.—80-page booklet titled "Annoted Bibliography on the Use of Organolithium Compounds in Organic Synthesis." Contains 223 references and a subject Index.

Gas Welding Supplies. Air Reduction Sales Co. 80 East 42nd St., New York 17, N. Y.—
16-page catalog describing the gas welding rods, fluxes, silver brazing alloys and carbon rods and plates made by this company. Includes data on lengths, packaging and available diameters for each welding rod.

Gas Pumps. Roots-Connersville Blower Corp., 900 West Mount St., Connersville, Ind.—16-page Bulletin 32-33-8-13 describes and illustrates this company's four standard rotary positive gas pumps. Includes line drawings showing longitudinal section of each type. Also gives gear and bearing details.

Arc Welders. Hobart Brothers Co., Hobart Square. Troy, Ohio.—8-page booklet gives, for each type in this company's line of arc welders, dimensions, specifications, and illustration.

Tube Cleaners. Elliott Co., Jeannette, Pa.
4-page Bulletin Y-24 on air or water driven
tube cleaners for small tubes, straight or
curved, made by this company. A size
tabulation is included.

Alloy Steel. Joseph T. Ryerson & Son. Box 8000-A. Chicago 80. III.—8-page booklet gives table of compositions, hardness curves, mechanical properties, information on nitriding and heat treatment and typical applications for line of special alloy steel made by this company.

Crane Scales. A. H. Emery Co., Stamford, Conn.—4-page leaflet contains descriptions and prices of the line of crane scales made by this company.

Separators. Selas Corp. of America, Eric Ave. and D St., Philadelphia 34, Pa.—Two 4-page leaflets describe the operational features and fields of application of the line of separators produced by this company.

Motors. Electric Machinery Mig. Co., Minneapolis 13, Minn.—20-page booklet. E-M Synchronizer No. 26, contains tables, graphs and photographs giving information on application of this company's large synchronous and induction motors and their controls in pulp and paper mills.

Instrument Parts. Reeves Instrument Corp., 215 East 91st St., New York, N. Y.—32-page booklet containing a catalog of standard instrumentation parts produced by this company. Describes standard parts technique.

Motors. Elliott Co., Jeannette. Pa.—4-page Bulletin 5600-1 discusses and illustrates the construction features of this company's high-speed, synchronous motors with direct, belt or gear drive. Explains features of rotor and stator and mechanical modifications.

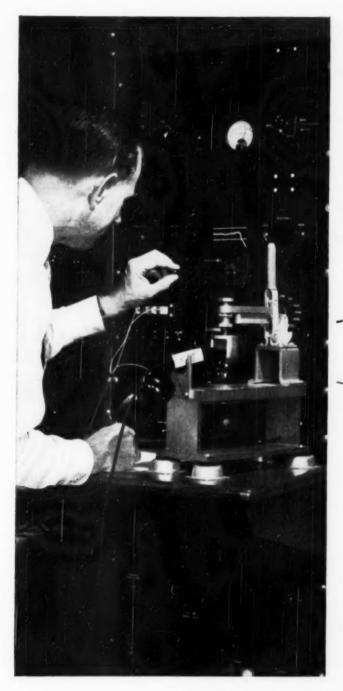
Weight Recorder. Yale & Towne Mfg Co., Philadelphia Division, Philadelphia Pa-12-page bulletin contains ten tables detailing available models and printing capacities of the weight recording attachments for scales made by this company Construction and operation are explained by text and illustrations.

Packaging, Hinde & Dauch Paper Co., Sandusky, Ohio.—Package design on corrugated boxes is discussed in a book called "Pack to Attract."

Reofing. Stonhard Co., 1306 Spring Garden St., Philadelphia 23, Pa.—4-page flyer discusses the use and features of the liquid and plastic roof resurfacers produced by this company.

Process Equipment. Lamson Corp. Syracuse 1, N. Y.—Two 4-page fivers covering the process equipment made by this company. Bulletin B-5-A deals with centrifugal type blowers and exacustors. The other leaflet ceals with their line of conveyors and carriers.

Instruments. Taylor Instrument Cos., 95
Ames St., Rochester I, N. Y.—4-page Bulletin 98099 describes and illustrates diagrammatically the construction, operation and Continued Continued



YOUR telephone receiver should treat each tone in the voice alike; that is important to you, because proper balance makes pleasant listening and easy understanding. Naturalness in receiver performance is pictured in a matter of seconds by the apparatus shown at left.

The receiver is clamped in place and an oscillator feeds into it frequencies representing all talking tones. Then a bright spot darts across an oscilloscope screen leav-

It listens so YOU can hear better

ing behind it a luminous line which shows instantly the receiver's response at each frequency. It is precise; and it is many times faster than the old method of measuring receiver performance point-bypoint and then plotting a curve.

At Bell Laboratories, development of techniques to save time parallels the search for better methods. For each time an operation is made faster, men are freed to turn to other phases of the Laboratories' continuing job—making your telephone system better and easier for you to use each year.



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EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE.

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Aerofin units do the job Better, Faster, Cheaper

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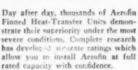
This air-pressure test is one of many tests used to control the quality of Aerofin finned heat-transfer surface. If no bubbles appear in the specially illuminated tank, it means the immersed Aerofin unit has withstood the terrific strains of steam and hydrostatic pressure tests and is ready to give you long, efficient service.

Rigid specifications and inspection, backed by more than 25 years of experience in manufacturing finned heattransfer surface, assure you of Aerofin dependability, durability and maximum efficiency.

Aerofin is devoted exclusively to the production of finned heat-transfer surface. This specialization enables Aerofin is select just the right surface and materials for the job, and to assemble these materials into a highly efficient unit.







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NEW YORK . CHICAGO . CLEVELAND . DETROIT . PHILADELPHIA . DALLAS . MONTREAL

MFRS.' PUBS., cont. . .

applications of the liquid level transmitters made by this company.

Conveyor Belts, B. F. Goodrich Co., Akron. Ohio.—4-page Catalog 2300 describes the construction and features of the cord conveyor belting made by this company.

Filters. Otto H. York Co., Inc., 364 Glenwood Ave., East Orange, N. J.—8-page leaf-let describes the use of the fine wire mesh made by this company for mist extraction, gas filtering, tower packing, cleaning and baffling.

Conveyors. Fuller Co. Catasauqua, Pa.— 12-page Bulletin F-H-1 contains a group of photographs illustrating the uses of this company's Airslide conveyors for fine dry materials.

Air Conditioning. W. B. Connor Engineering Corp., 114 East 32nd St., New York 16, N. Y.—16-page booklet entitled "A Dream of Green Air" discusses the costs involved when this company's air recovery system is used and when it is not. The use of activated carbon in the system is explained.

Protective Coatings. Prufcoat Laboratories, Inc., 63 Main St., Cambridge 42, Mass. —7 pages included in a file folder give properties and prices of the protective coatings made by this company. Photographs showing applications are included.

Concrete Lining. U. S. Rubber Co., Rockefeller Center, New York 20. N. Y.—Manual covers installation, relative costs, applications, and specifications of the absorptive form lining produced by this company for use in the construction of concrete surfaces.

steel Piling Rental. L. B. Foster Co., P. O. Box 1647, Pittsburgh 30, Pa.—4-page fiver describing the steel piling which this company has available for rental to contractors.

Tapes. Robert Spector Co., 22 Park Place, New York 7, N. Y.—24-page brochure titled "Scotch and Industrial Pressure-Sensitive Tapes and their Uses" generously sprinkled with photographs showing applications of tapes produced by this company.

Steam Specialties, Strong Carlisle & Hammond Co., 1992 West Third St., Cleveland 13, Ohio.—32-pase Catalos No. 684 covering this company's line of traps, strainers, reducing valves and other ateam specialties. Centains specifications and illustrates applications.

Flexible Metal Hose. Chicago Metal Hose Corp., Maywood, Ill.—68-pase Catalog G-50 describes this company's line of standard flexible metal hose in a variety of metals. Dacludes sections on expansion joints for piping systems, stainless steel and brass bellows and various conduits and special assemblies of these components.

Air Hose. New York Belting and Packing Co., I Market St., Passaic N. J.—Booklet describes this company's lines of air hose for welding, service stations, underground mining, pneumatic tools and general air drill service.

Switchgear, Allis-Chalmers Mfg. Co., 1126 South 70th St. Milwaukee, Wis-S-page bulletin 1886376A describes metal-inclosed low-voltage switchgear and drawout air circuit breakers produced by this company, Illustrates construction and installation features.

Steel Specialties. Stainless Foundry & Engineering Co. 5132 North 35th St., Mil. Waukee 9, Wis.—4-page leafiet covers the line of stainless steel castings and other specialties produced by this company.

Chemicals. Blockson Chemical Co., Jollet, III.—44-page booklet describing each of the chemicals produced by this company. Covers properties, principal uses and packing.

Electrical Equipment. Reliance Electric & Engineering Co., Cleveland, Ohio.—2-page flyer describing and illustrating this company's rotating regulator for voltage and current.

Heating Equipment. General Electric Co., Schenectady 5, N. Y.—Fire different application data booklets cover the major uses of tubular, strip, and cartridge heaters in industry.

Nickel Alloys. International Nickel Co., 67 Wall St., New York 5, N. Y.—44-page Bulletin T-3 entitled "Resistance of Monel. (Continued)



In the manufacture of pharmaceuticals (local and parenteral anesthetics are examples) . . . and in the preparation of cosmetics (like the creams and lotions that help dissolve the pigments in freckles)—glycerine's usefulness is constantly increasing. And here's why—

Glycerine's combination of physical and chemical properties can be matched by no other product. Glycerine is a carrier... a solvent...a softener...an emollient...a humectant...a preservative. It's safe. It's edible. It's nutritious. It can be applied, in proper dilutions, to any part of the body.

"When we're stumped," a leading chemical consultant writes, "we always try glycerine. You'd be surprised how often it works."

That's why-in the pharmaceutical, cosmetic and almost every industry-Nothing takes the place of glycerine!

GLYCERINE PRODUCERS' ASSOCIATION

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CHEMICAL ENGINEERING-July 1949

Technical Glycerine News

GLYCERINE SECTIONS OF BEILSTEIN TRANSLATED! Now available for the first time, an English translation of the Glycerine Sections of Beilstein's famous Handbuch der Organischen Chemie (4th Edition). Complete in one volume entitled "CLYCERINE AND SOME GLYCERINE DERIVATIVES." Publication authorized by the Attorney General of the United States, Compiled and edited by Dr. R. N. Du Puis, Dr. C. S. Miner, Jr. and J. B. Segur-long acknowledged as authorities in the field of Glycerine and its properties. Amassed in its 210 pages are an unusually large number of Glycerine derivatives with extensive crossreferences. Also included are a complete table of contents and a detailed index of the derivatives and fatty acid esters of Glycerine. A timely, comprehensive volume for your chemical reference library. Order from the Glycerine Producers' Association enclosing \$2.50 (check or money order) for each copy.

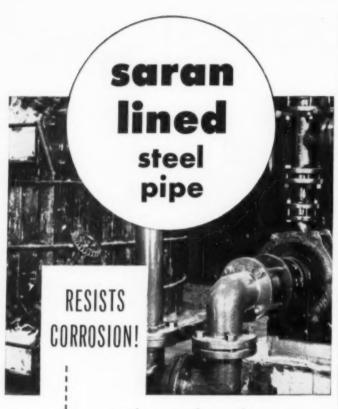
TO STABILIZE PENICILLIN AEROSOLS, the addition of a small quantity of glycerine to a penicillin solution is recommended by a group of investigators. (D-13)

AN ABRASIVE-FREE FABRIC-BASE RAZOR STROP can now be made with a new chemical composition, according to a recent patent. The composition is said to contain beeswax, cressote, cresylic acid, an aryl-phenol, and glycerine among other ingredients. (D-14)

A NEW MATERIAL FOR MEDICINAL CAP-SULES is described as containing hydrolized gluten, mineral oil, gelatin, glycerine and water. (D-15)

STABLE EMULSIONS OF OIL AND GLYCER-INE can now be obtained by the addition of a small amount of prolamine as an emulsifying and stabilizing agent, a recent patent states. (D-16)

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GLY CENT	DISON AVENUE		she source
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reduces shut-downs! readily field-fabricated! available immediately! lower in cost!

Saran lined steel pipe is available in maximum lengths of 10 feet and in sizes from 1 to 4 inches inclusive.

(Also available are saran lined plug valves, flanges, reducing flanges, flanged fittings, gaskets and fittings with union ends.

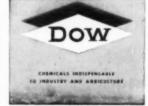
Write us today for further information concerning saran lined steel pipe and how it may solve your problem.

Manufactured by The Dow Chemical Company, distributed nationally by Saran Lined Pipe Company.

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MERS.' PUBS., cont. . . .

Nickel and High-Nickel Alloys to Corrosion by Sulfuric Acid." Tables, text and photographs cover the performance of over 30 different nickel-bearing materials in a range of operations from pickling steel to petroleum refining and textile processing.

Stainless Steel. Babcock & Wilcox Tube Co., Beaver Falis, Pa.—A reference card, TDC-122, on this company's stainless steels for tubing, giving standard type numbers by which grades are identified and chemical composition limits and ranges.

Turbines. Westinghouse Electric Corp., P. O. Box 888, Pittsburgh 30, Pa.—20-page booklet B-3896 describes the Type E industrial turbines produced by this company. Cutaway views show operating features and construction.

Wet-Grinding Mills. Hardinge Co., 240 Arch St., York. Pa.—16-page Bulletin AH-389 covering conical mills (with operating data and Bowsheets), convex-head cylindrical mills, nod mills and related equipment produced by this company.

Process Equipment. J. H. Day Co., Cincinnati 22, Ohio.—16-page booklet describing this company's line of sifters, mixers and other equipment for processing liquids, powders, granulars and light pastes. Cross-sectional drawings and tables of sizes are provided for the various pieces of equipment.

Valves, Edward Valves, Inc., East Chicago, Ind.—4-page Bulletin 711 covers the line of forged steel relief valves produced by this company. Includes data on dimensions data on dimensions the valve.

Sodium Sulphite, W. H. & L. D. Betz, Gillingham and Worth Sts. Philadelphia 24, Pa.—6-page Technical Paper No. 114 entitled "Catalyzed Sodium Sulfite" describes the use of sodium sulphite, made by this company, in preventing corrosion.

Protective Paints. Speco, Inc., Cleveland, Ohio.—i-page flyer lists typical applications of the acid and alkali-resistant line of paints produced by this company.

Insecticide. Julius Hyman & Co. Denver, Colo.—4-page Technical Supplement No. 203-C describes a chiorinated hydrocarbon insect toxicant produced by this company, Gives available formulations, application and recommended dosage and dilution table.

Hydraulic Equipment. Miller Motor Co. 4027 North Kedzie Ave., Chicago 18, Ill—16-page booklet includes a copy of the "Joint Industry Conference Hydraulic Standards for Industrial Equipment." Contains also a point-by-point comparison with cutaway illustrations showing how this company's cylinders meet the JIC standards.

Water Conditioners. Permutit. Co., 330 West 42nd St., New York 18, N. Y.—16-page booklet describing the use of this company's water softeners and ion exchangers. Contains labeled diagrams and cutaway drawings of equipment.

Pressure-Creosoled Foles. Koppers Co., Wood Preserving Div., Koppers Bldg., Pittsbursh 19, Pa.—18-page booklet titled "Fole Buyers' Guide" presents service records, electrical resistance information and competitive cost faures. Includes five tables of dimensions for different species of poles.

Monel Roofing. Interests appeties of poles.

67 Wall St., New York 5, N. Y.—4-page folder lists suggested gages for exterior building applications of the soft-temper Monel roofing sheet produced by this company.

Electrical Connections. Electric Railway Improvement Co., 2070 East Sist Pl., Cleveland, Ohio-S-page catalog describing a method of welding copper to either steel or copper, in which no outside source of produced by this company are illustrated.

Conveyors, Barber-Greene Co., Aurora, Ill.

—8-page Bulletin 363 includes sketches
showing various applications of the portable belt conveyors produced by this company. Includes photographs of construction features.

Roller Chain. Atlas Chain and Mfg. Co., Castor & Kensington Aves. Philadelphia (Continued) a major advance in the mechanical refinement of classification units



... the Dorr



■ Chalk marking the take path of a duplex Borr HX Classifier in shop demonstration.





Classifier

Incorporating an entirely new and radically different headmotion design and rake path, the new Dorr Type H Classifier line represents a major step forward in the mechanical refinement of classification units. It offers many definite advantages over its predecessor, the Type F... yet retains all the features which have made the Dorr Classifier an accepted standard throughout the world.

Simplicity is the keynote of Type H design. It has few moving parts and the simplest Classifier lubrication system yet devised. It employs a fully harmonic raking motion and a long, full-load raking stroke. It is equipped with a hydraulic lift mechanism that provides more than 12 inches of rake lift in the pool. It is designed for work... for high efficiencies and low operating cost.



Bulletin #2281 gives complete information on this radically different unit. Write for your copy now . . . or better still, have a Dorr engineer show you what the superiority of Type H design means in terms of your own operation. No obligation, of course.

RESEARCH DECIMENTS PROPERTY

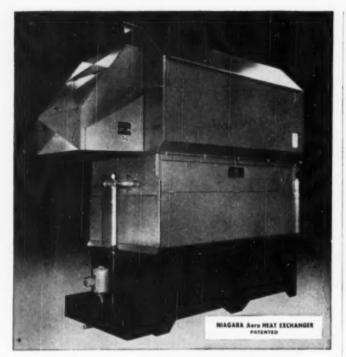
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THE DORR COMPANY, ENGINEERS

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SAVE COOLING WATER Get Many Other Benefits and Cost Savings

 Niagara Aero Heat Exchangers provide faster and more accurate cooling to specified temperatures for liquids in many industrial processes.
 They help lower production costs.

Cooling by the evaporative principle, they transfer heat to air, which is easily disposed of, and consume less than 5° of water used in conventional cooling methods. A Niagara Aero Heat Exchanger replaces both shell-and-tube cooler and cooling tower, and saves piping and pumping. Its savings quickly return its cost.

It helps improve the quality of production by removing heat at the rate of in-put, and by greater accuracy of control. For example, as applied to heat-treat quenching or to a chemical process cooling, provision for heating as well as cooling saves the time and prevents the product losses of a "warm-up" period.

Successful applications also include control of temperatures for jacket coolants for engines, hydraulic equipment, transformers and electronic sets, and special industrial equipment.

Write for Bulletin No. 96

NIAGARA BLOWER COMPANY

Over 33 Years of Service in Industrial Air Engineering
Dept. CE 405 Lexington Ave., New York 17, N. Y.
District Engineers in Principal Cities



MFRS. PUBS., cont. . .

24. Pa.—12-page catalog contains engineering drawings and component photographs illustrating construction of the roller chains produced by this company. Specifications and prices for single and multiple chains are given in tabular form.

Solvents. American Mineral Spirits Co., 230 North Michigan Ave., Chicago 1, Ili.—8-page booklet entitled "Solvents for Modern Industry" contains charts detailing significant properties of various solvents produced by this company. Lists suggestions for uses of the solvents.

Electrical Brakes. Westinghouse Technical Press Service. 366 Fourth Ave., Pittsburgh 50. Pa.—24-page Section 24 of a series of "Hints on Electrical Maintenance" published by this company, this time dealing with electrical brakes.

Valves. Seliers Injector Corp., 1600 Hamilton St., Philadelphia 30, Ps.—8-page Report No. 94 describes the design features and applications of the abut-off valves produced by this company. Includes four full-page photographs showing the valves in use under various conditions.

Cast Iron. Lincoln Electric Co., Cleveland 1, Ohio.—4-page Bulletin 465 contains directions for welding cast iron.

Drainers. Industrol Corp., 88-35 75th Ave., Clendale. Brooklyn 27, N. Y.—1-page Bulletin CD-100 describes this company's drainers for removing large quantities of condensate from heating applications.

Flexible Hose. American Ventilating Hose Co., 15 Park Row, New York 7, N. Y.—12page Catalog No. 30 illustrating and describing the types of lightweight flexible hose made by this company and their applications.

Heat Exchanger. Oriscom-Russell Co., 283 Madison Ave., New York 17, N. Y.—8-page folder describing and illustrating outdoor and indoor installations of the air-cooled heat exchange unit made by this company

Hand Pump. Romec Pump Co. Div., Lear. Inc., Elyria. Ohio.—4-page brochure, Catalog No. 4-25A, llustrating the line of handoperated barrel-type pumps produced by this company.

Jaw Crushers. Pennsylvania Crusher Co., Liberty Trust Bidg. Philadelphia 7, Pa.— 12-page Bulletin No. 5011 covering this company's line of jaw crushers containing cutaway drawings and diagrams showing construction and principles of operation.

Instruments. Sperry Products, Inc., Danbury, Conn.—Bulletin 3700 describes this company's portable ultrasonic instrument for measuring thickness of materials from one side only.

Centrifugal Pumps. Lawrence Machine and Pump Corp., 371 Market St., Lawrence, Mass.—id-page Bulletin 203-4 describes the applications of this company's centrifugal pumps in the chemical process industries. Contains, side by side, a picture and a diagram showing the construction of each of the pumps.

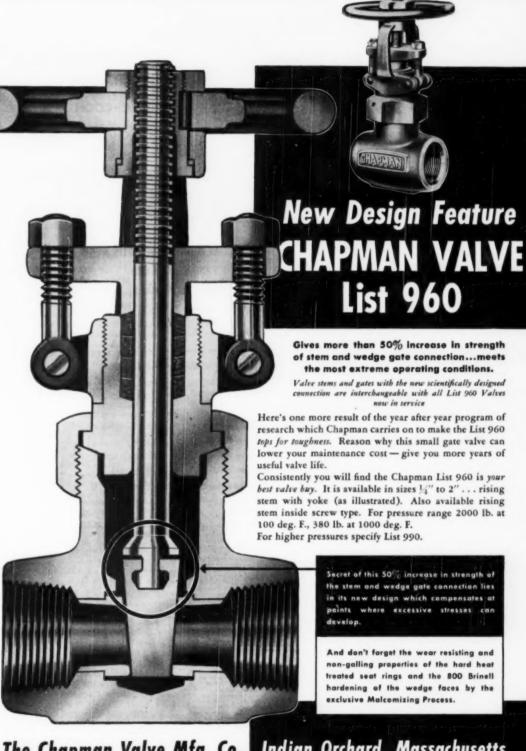
Combustion Equipment. Bryant Industrial Div. Affiliated Gas Equipment, Inc., 1920 London Rd, Cleveland 10, Ohio.—Two catalogs describe the equipment produced by this company. No. ID-257-A is a 4-page fiver describing their gas combustion unit and proportional misr. No. ID-292 catalogs in 16 pages their misers, burners, controls, valves, regulators etc.

Conveyors. Sandvik Steel, Inc., Conveyor Dept., 111 Eighth Ave., New York 11, N Y. —4-page leafter illustrates and describes the line of steel belt conveyors produced by this company.

Copper Alloys. Ampco Metal. Inc., Dept. WN-1, 1745 South 38th St., Milwauke 4, Wis.—4-page leaflet contains case histories demonstrating the use of the copper alloys made by this company.

1948—Apnual Review. Allis-Chaimers Mfg. Co. Box 512. Milwaukee I, Wis.—4-page booklet describes the engineering developments this company has contributed to various industries. Generously illustrated with photographs.

Carbon Black. Binney & Smith Co., 41
East 42nd St., New York 17, N. Y.—2-page
Bulletin No. 153 describes this company's
densed flow black for roller or disk type
mills.
—End



The Chapman Valve Mfg. Co., Indian Orchard, Massachusetts

NOW AVAILABLE ...

in COMMERCIAL **OUANTITIES**

Aconitic Acid

CH,-COOH C-COOH HOOC-CH

The only UNSATURATED TRIBASIC ACID On the Market

· Aconitic Acid, available until recently only in pilot plant quantities, is now available in commercial quantities and already is used in several important commercial applications.

POTENTIAL USES

Aconitic Acid offers many interesting possibilities in its unchanged form and as an intermediate for the preparation of other compounds, Specifically, Aconitic Acid is valuable in the preparation of sulfonated wetting agents. Makers of alkyd resins may find it useful in the preparation of these products. The esters of Aconitic Acid appear promising as plasticizers. Also useful for plasticizers because of their great stability are the esters of Tricarballylic Acid, made by the hydrogenation of Aconitic Acid.

TYPES OF REACTIONS

Aconitic Acid undergoes the usual chemical reactions of an organic acid. For example, Aconitic Acid will form:

- 1. Salts and acid salts.
- 2. Esters.
- 3. An Anhydride.
- 4. An Acid ehloride.
- 5. A Triamide.

Although not extremely reactive, the double bond of Aconitic Acid will undergo reaction such as sulfonation and halogenation (with a mercuric sulfate catalyst). Heating dilute solutions of Aconitic Acid at 100° C yields Itaconic Acid.

PHYSICAL CHARACTERISTICS

Molecular Weight

White Crystalline Powder Appearance

Odor

Melting Point 195°C. with Decomposition

Solubility in Water in 25 C. 26.4 Gm./100 ml.

Solubility in Water @ 90°C. 110.7 Gm./100 ml.

Solubility in Ether Sparingly Soluble

Solubility in Acetone Soluble

Soluble - Increased solu-Solubility in Lower Alcohols bility when hot.

For prices and detailed information on this new unsaturated tribasic acid write Chas, Pfizer & Co., Inc., 630 Flushing Ave., Brooklyn 6, N. Y.: 425 North Michigan Ave., Chicago 11, Ill.; 605 Third Street, San Francisco 7, Calif.



PFIZER

Manufacturing Chemists Since 1849

Chemical Economics

RICHARD F. WARREN, Assistant Editor

Competitive Markets Spur Activity in All Parts of Process Industries

Most chemical process industry firms are concentrating their major efforts on sales development lines these days. This return to competitive markets has really stimulated the industry. The complacent attitudes developed by some firms during the war and postwar peaks have worn off, and the customers are asking for quality products a minimum costs.

Production Trends

New chemical capacities will be arriving on the scene this summer, as major expansion plans in the chemical industry move toward completion. However, in view of the easing of demands in many lines, full use of some new facilities may be temporarily delayed. Take the case of the synthetic resin industry. The last resin to fall from the "short supply" category was polyethylene. With new units operating, production in 1949 will more than triple the 1948 rate. Supply should be adequate this year.

Fertilizer output, reflected by superphosphate production, continued at about the same daily rate in April as that reached in March. Potash producers are expanding their facilities with an eye on growing use of chemical-grade potash salts according to industry spokesmen.

Lead and zinc pigment producers report some stimulation in output as a result of the recent series of price declines and a gradual lowering of inventories at most levels.

After a serious downward slump in April shipments of rayon varn and staple fiber rose by 5 million pounds in Max. But this was still far below May 1948 rates. Filament yarn shipments were 25 percent under May 1948 levels. Rayon stocks increased 7.5 million pounds from April to May. For the first five months rayon deliveries are lagging almost 23 percent behind the same 1948 period. On the optimistic side, F. E. Altmaier of Du Pont's rayon division says that this slump can be compared with the September 1936 to March 1939 period. Comparing this period with the February 1948 to date curve he

showed members of the Chemical Market Research Association at their annual meeting that a remarkable correlation exists if production data are plotted over these two periods. In fact the January-April break is almost equal in magnitude to a similar drop that occurred in the prewar interval. He stated that market conditions in the 1936-39 period were very similar to the current situation. On this basis he said, an upward surge in business should occur in fall or late summer.

More Returns on Census

More returns on the Census of Manufacturers are coming out every day. The accompanying table gives the highlights of some of the industries of interest to chemical engineers.

Regional breakdowns show the general effect of the chemical migration to the South and West. For example, in the Pacific Coast area value added by manufacture in the chemical and allied product industries went from \$83.9 million in 1939 to \$307.5 million in 1947. In the East South Central area value added to product rose from \$101.6 million in 1939 to \$292.0 million in 1947. However, the Middle Atlantic area showed an increase from \$660.7 million in 1939 to \$1,652.6 million in 1947 for the same classification. New England fell behind the Pacific area in this category. In 1939 New England added \$85.5 million to chemicals and allied products value. In 1947, \$215.1 million were added. This is well below the average growth in the country for the eight year interval. On the other hand the West South Central Area's chemical and allied products grew from \$65.3 million to \$389.3 million in that period.

Price Trends

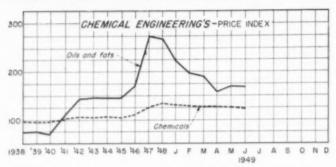
Ethyl alcohol prices went up on July 1. SD-1 is 31.5c, per gal, in tanks, Producers hope the advance will stick. Pricewise, chemical markets were quiet late in June.

Results of Census of Manufacturers for 1947 Show Huge Growth

Industry	Number of Establishments 1947 1939		Number of Employees 1947 1939		New Plant & Equipment (Millians) 1947 1939		Value of Shinments (Millions) 1947 1939	
Alkalis and chlorine	32	33	19.853	0.5.	\$56.4	n.s.	\$208.6	\$101.9
Beet sugar		85	13.412	12.324	12.5	2.9	262 9	117 4
Cane sugar refining		97	17,376	16,824	5.9	2.6	818.4	344 9
Clay refractories		165	17,978	13,655	5.9	1.2	109.4	42.2
Cleaning & polishing preparations		637	15,352	9.978	9.7	1.5	261.6	89.8
Cork products	36	35	2,485	3.597	p.a.	n.a.	30.1	17.7
Distilled liquors		361	30,422	15.836	23.0	75.76	0.5.	11.8.
Flat glass		37	27, 241	19 639	11.6	2.1	242 8	102.4
Gaskets & ashestos insul		134	12,960	7,531	4.0	0.8	118.2	37.2
Glass containers		77	47,132	29,357	32.8	8.8	422 6	158.3
Grease and tallow		210	12,497	6.536	12.7	1.8	305.7	58.2
Gypsum products		68	7.472	5,863	24.3	4.0	127.5	46.2
Hydraulic cement		160	35,602	24,530	42.5	7.6	408.9	192.6
Inorganic color pements	94	80	13,140	D.D.	19 4	0.8.	270.0	79.4
Medicinal chemicals		20	12.388	D.B.	13.5	D.3.	201.8	21.0
Mineral wool		45	8.874	9.4.	13.2	n.s.	73.1	7.9
Morticians' goods		599	22.375	16,615	3.4	0.5.	156.8	70.4
Pharmaceutical preparations		1.000	65.582	71.8.	50.4	n.a.	941.7	338.2
Plastics products, n. c. c	1 200	216	00,092	17,953	27.0	3.5	503 0	71.9
Paints & varnishes	1 701	1,125	53.412	n.s.	33.9	0.0	1.248 8	427 1
Paper bags	193	119	22.265	12,703	9.1	1.9	320.4	85.7
Paper & board		050	128,684	115,227	204.9	37.5	2.812.0	955.9
Plywood plants		96	26,499	0.8.	10.1	n.s.	264.5	49.1
Pottery products, n. e. c		0.8.	9,733	0.8	2.6	n.a.	39.9	11.5
Pressed & blown glam ware, n. c. c	126	115	42,170	31,320	16.3	2.7	234.8	97.3
Primary aluminum		4	8,919	3.334	2.8	1.8	160.4	64.6
Primary batteries		31	10,261	n.a.	n.z.	11.2.	85.0	n.a.
Pulp mills		194	50.290	30.613	85.5	B.S.	939.6	226.8
Raw cane sugar		76	4.635	5.294	5.1	1.6	60.1	32.6
Rubber footwear industry		13	28,125	18,098	5.0	1.5	198.7	50.0
Rubber industries, n. e. c		819	113,240	63,139	47.1	10.3	953.5	264 5
Soap & glycerine		264	27,660	20.190	26.1	8.7	1.085.8	302.6
Storage batteries	247	190	16,607	D.B.	B.B.	Dilli.	298 4	21.76.
Synthetic fibers	31	30	71,882	55,475	B.S.	0.5.	705.3	0.3-
Synthetic (chemical) rubbe?	19	0.0	7,663	D.B.	4.1	n.s.	235.2	0.8.
Tires and inner tubes		83	115,687	67,140	54.9	17.0	1,547.0	580.9
Veneer mills	156	130	10,461	n.s.	3.7	0.2.	67.5	20.6
Vitreous & semivitreous plumbing fixtures	33	25	7,831	5,140	2.9	0.5	68.1	22.0
Wood preserving		218	16,347	12,623	6.2	0.5-	304.0	106.3
Industrial inorganic chemicals, n. c. c.		307	45,494	0.4.	68.3	n.s.	672.6	302.2
Industrial organic chemicals, n. e. e		192	83,015	0.6.	258.7	11.0.	1,445.2	376.6

PRICE. CONSUMPTION AND PRODUCTION TRENDS

PRICES ==



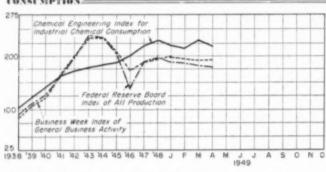
Weighted Index

Chemical Engineering Index

Prices

	Chemicals (His & Fats
As of July 1	122.64	156.86
Last Month	123.29	166.27
July 1948	132.59	293.07
July 1947	123,23	220.34
	19	37 = 100

CONSUMPTION=

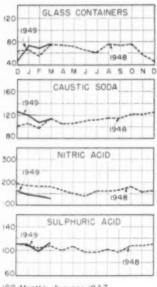


Index Itemized

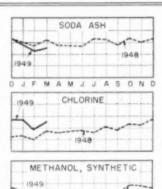
Chemical Engineering Index Industrial Consumption of Chemicals

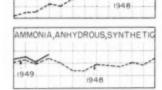
	March	April
	(Revised)	
Fertilizers	61.81	59.95
Pulp and paper	23.20	20.25
Petroleum refining	21.71	20.10
Glass	17.89	16.60
Paint and varnish	23.35	24.01
	15.40	14.28
Iron and steel		
Enyon	20.98	19.65
Textiles	9.72	8.18
Coal products	11.15	10.86
Leather	4.51	4.21
Explosives	6.36	7.77
Rubber	5.22	4.85
	8.32	8.65
Plastics	0.00.	8,60
INDEX	229.62	219.36
Anteresia Interes	1935	100

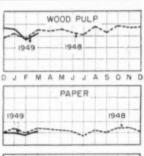
PRODUCTION ===

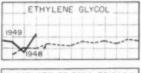


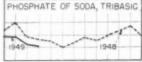
100-Monthly Average 1947













Detergency gets a "big boost"

with WYANDOTTE CARBOSE

Specialized grades of Sodium CMC

Wyandotte Carbose* is a unique compound developed especially for detergent applications. When used in conjunction with both "built" and "unbuilt" detergent products, it boosts the cleaning ability of these products to a remarkable degree.

In the washing of cottons and other fabrics, with soils running from the lightest to the heaviest, formulations containing Wyandotte Carbose consistently provide more thorough soil removal and greater whiteness retention.

Carbose is also used in the production of improved water-base paints, textiles, paper and adhesives.

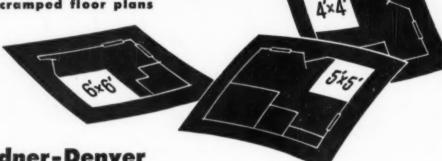
No matter what your Caustic Soda requirements may be, you can rely on Wyandotte for prompt, dependable deliveries – together with any technical assistance you may need.

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SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
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CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE • CHLOROETHERS
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS



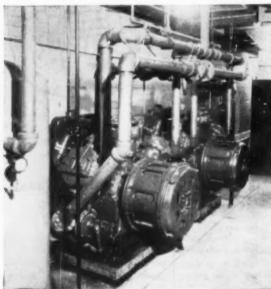
To help you get <u>bigger air capacity</u> from cramped floor plans



"WB" Compressors

are made





Compact Gardner-Denver "WB" Two-Stage, Vertical Water-Cooled Compressors, with built-in motors.

Here's how you can have greater air capacity—even though floor plans are crowded! Install a Gardner-Denver "WB"—the vertical, two-stage compressor that's built in seven space-saving capacities from 142 to 686 cubic feet displacement per minute. The smallest size fits into a four-foot square—the largest requires only about six feet each way.

Compactly designed with integral motor and self-contained cooling system, the "WB" rates high in efficiency. Completely water-jacketed cylinders and heads, plus balanced construction — two low pressure cylinders for each high pressure cylinder—assure low power costs and an air supply you can always count on.

Other big "WB" advantages:

- * Duo-Plate "air-cushioned" valves quiet, simple and durable.
- * Timken tapered roller main bearings.
- * Force-feed lubrication system.
- * Furnished with built-in motor or with sheave for "V"-belt drive.

For complete information, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER SINCE 1859



TETRACHLOROETHANE

John R. Skeen

The extraordinary expansion in the production of tetrachloroethane from about 55 million pounds in immediate prewar years to over 450 million pounds in 1944, was mostly occasioned by military needs. Thus, directly and through its derivatives, tetrachloroethane was required to degrease metals, to prepare gas-proof clothing, as an ingredient of smoke materials, and for a miscellany of uses. Practically none of this chemical reached the civilian economy. Only in recent months has the supply become equal to the demand. With the new processing facilities in operation this year and others contemplated, adequate production appears to be assured

Tetrachloroethane has few and unimportant direct uses. Probably no more than 50 million pounds has been so required in any year, almost all of which was to gas-proof clothing. The chemical is economically significant as an intermediate. Prepared by the chlorination of acetylene, some pentachloroethane is simultaneously formed. By dehydrohalogenation, trichloroethylene results. This has become the outstanding metal degreasing liquid of the chlorinated hydrocarbon type. Of minor use in dry cleaning, trichloroethylene is also employed to prepare

JOHN R. Skeen is market research director for Foster D. Snell, Inc. the chemical sequence pentachloroethane, tetrachloroethylene and hexachloroethane,

Tetrachloroethylene was consumed to the extent of nearly 60 million pounds in war years mostly as an ingredient of smoke generating materials. More recently, use has developed in the preparation of leather dressings to resist mildew, medicinally in the treatment of internal parasites, and in dry cleaning. It has always had a market for metal degreasing. Nearly 50 million pounds of hexachlorothane were consumed annually during the period 1943-45, almost exclusively for making smoke bombs, floats and shells. Production has since decreased sharply.

The commercial history of tetrachlorethane and trichloroethylene began in the early 1920's at which time Dr. Alexander Wacker, Gesselschaft fur Electrochemische Industrie Gmbh, began production. The Roessler and Hasslacher Chemical Co. was, perhaps, the only importer in the United States. The total amounts of both chemicals obtained from Germany did not exceed \$00,000 lb. in the early vears and amounted to only one million pounds in 1937. Wacker, through its subsidiary, the Consortium fur Electrochemische Industrie, appears to have developed most uses abroad very early and the commercial value of trichloroethylene was soon recognized.

Because of its non-flammable and non-corrosive characteristics as well as stability at ordinary temperatures, trichloroethylene was first employed in dry cleaning. With price decline, outlets became practical in the extraction of oil, and for insecticides and fumigants. In 1925, Roessler and Hasstacher began manufacture from tetrachloroethane at Niagara Falls, N. Y. Sales were small because of the competition of the older carbon tetrachloride and the newer trichloroethane and trichloroacetic acid introduced by Dow Chemical Co. in 1924.

The rise of trichloroethylene to its position of importance is attributed to the development of the degreasing application. Cleaning metal surfaces, especially for electro-plating, was accomplished by sundry dipping processes employing multiple baths of alkalis, trisodium phosphate or naphthas. The Consortium was the leader in immersion equipment for trichloroethylene and in 1932 licensed G. S. Blakeslee and Co. (Michigan) for production and sale. The Carrier Engineering Co. of London became interested in the problems of degreasing and appears to have developed the first practical vapor degreaser. Through its subsidiary, Carrier Research Corp. (N. J.), the equipment was introduced domestically in 1927. Four years later, the Rex Products and Mfg. Co., later Detrex Co., introduced a comparable apparatus believed to be of the immersion type. From the viewpoint of mechanics, the vapor principle seemed to be best for many purposes and was particularly adapted to many of the chlorinated solvents. Two factors determined choice of solvent: the heat requirements for making adequate (Continued on page 318)

Tetrachlorocthane is an important intermediate with few direct end uses

				Tetrachloroethane						Trichloroethylene	
			Cor	nsumption?							
			Chemical		Use			Chlorine		Prices	
1934 1935 1936 1937 1938	-	Production 11.5 30.5	Trichloroethylene 10 16,5 28.5 44 36	Other ⁷ 1.5 2	Degreasing 4 4.5 10 20 30 25	Producers ¹ 318 2 2 2 2 2 2	Prices e./lb.	Consumed. 7. Total Cl- 1.8 3.2	Producers) 311 2 2 2 2 2 2 2	e./lb. 8.9 8.9 8.9 9.0	
1939 1940 1941 1942 1943		96 156 225 370	45.5 71 105 155 265	25 45 70 105	35 50 87 140 235	2 2 3 8 3	8 8 8 8	6.1 8.2 9.4 13.0	. 2 3 3 3 3	8.3 8.0 8.0 8.0 8.0	
1944 1945 1946 1947 1948		350 290	331 275 270 330	132 73 20 25	300 255 250 310	3 3 3 3 4	8 8 8 8	15.4 13.1 11.1 10.1	2 3 3 4 4	8.0 8.0 8.0 8.9 9.8	

¹ Approximate only and includes tetrachloroethane produced for use as such and for conversion into trichloroethylene, tetrachloroethylene and hexachloroethane; exclusive of co-product pentachloroethane. Units are millions of pounds. Tetrachloroethane equivalent as estimated. Units are millions of pounds. As reported by Tariff Commission, excepting 1948. * 1936–45: Bureau of Labor Statistics, drums, fob. works; 1946–48: Oil, Pant & Drug Reporter, drums. works. * 48. reported by Tariff Commission. * 1936–45: Bureau of Labor Statistics, drums, cl., fob, works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob, works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–48: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–49: Oil, Pant & Drug Reporter, drums, cl., fob works (freight allowed Zone 1); 1946–49: Oil, Pant & Drug Reporter, drums, cl., fob works, for the pant description of the pant

allowed Zone 1). Tetra (per) chloroethylene, hexachloroethane, produce pentachloroethane for direct use. Trichloroethylene and tetrachlore chylene; almost entirely trichloroethylene except in recent years; a mino amount of tetrachloroethane has been so used. Insufficient data fortryation; trade estimates place total at close to 100 million fb. "Include du Pont, Dow and Westvaco; Dow discontinued in 1935 and produced one more in 1941 and after. Included du Pont. Carbide and Westvaco in 1934 with Carbide discontinuing in 1935, Dow began manufacturing in 1940 Hooker-Detree began 1947, and Niagara Alkali in 1949.

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United States Production of Certain Chemicals

March 1949, March 1948 and February 1949, February 1948

Chemical (Tons unless otherwise noted)	March 1949	March 1948	February 1949	February 1948
	108.419	100,142	90,917	90,550
Ammunia, synthetic, anhydrossi	65.079	95.407	40.005	48,649
Ammonium sulphate, synthetic (M lb.)	36,942	28,779	90,975	31,712
Attimontum sulphate, synthetic (M Ib.)	129	3,379		2,433
Calcium arsenute (M lb.) Calcium carbide, commercial	54,123	61.499	56,410	86,086
Calcum carbide, commercial	07,100	00.400		
Carbon dioxide:	21,127	20,511	16,494	17,274
Liquid and gas (M Th.)	52,129	30.079	41.2%5	42,030
Solid (M lb.)	149,693	132,668	136,431	116,143
Chlorine	530	1,240	842	977
Chrome green (M lb.)	2.061	4,596	2,410	3,907
Chrome yellow and orange, (C.P.) (M lb.)		36,579	31,094	23,940
Hydrochloric acid	42,500	2.26%	2.292	2,119
Hydrogen (M cu. ft.)	2,281		4.009	3.697
Lend amenate, acid and basic (M lb.)	2,533	3,654	331	479
Molybdate chrome orange, (C.P.) (M lb.)	263	474	90.545	100.546
Nitrie acid	45,640	101,041	1,364	1.258
Oxygen (M etc. ft.)	1,863	1,361		90,801
Phosphoric acid (50 percent HiPOs)	114,237	105,097	107,134	200,1001
Soda ask:				
Ammonia-soda processo			****	200,437
Total wet and dry [†]	349,549	404,525	329,076	
Finished light ⁸	196,123	202,798	185,797	191,173
Finished dense	102,002	134,765	96,371	111,097
Natural 4	15,837	23,896	15,949	23,403
Sodium bicarbonate, refined	13,603	14,689	11.825	14,171
Sodium bichromate and chromate	8,116	7,971	7,987	7,105
Socium hydroxide:				
Electrolytic process				
Liquids	138,982	130.292	134,847	112,669
Sold	23,492	24.297	27,130	21,262
Lime-soda process	80, 802			
Liquid	53.965	68 366	53,493	-61,026
	18,232	21,982	18,841	20,243
Solid	177,678	No. of Contract of		
Sodium phosphate: Monobasic	948	1.194	550	829
Monobauc	10.335	8.546	10.400	6,063
Dibasic	5,569	6.345	5.815	6,739
Tribasic Meta	1,791	3,461	2.298	2,609
Meta		6,105	6 888	5,103
Tetra	6,845	54,702	31,683	44,090
Sodium silicate, achydrous	36,892	199 , 1116	22,000	861000
Sodium aulphate:	** ***	14.220	12,628	12,256
Anhy drous	11,826		13.649	15,654
Glauber's salts	13,554	15,826	53, 890	48,528
Salt rakes	52,069	53,862	33,590	40,000
Sulphyric acid 5.7	200 111	0.0.000	221 795	274,047
Chander process	282,161	294,954	221,190	867,509
Contact process, new	965,64%	614,727	1780,304	601, 1000

Data for this tabulation have been taken from "Facts for Industry" series issuady Bureau of the Census. Production figures represent primary production and do not include purchased or transferred materials. Quantities produced by government owned arsenals, ordnance works, and certain plants operated for the government of included. Chemicals manufactured by TV. All tons are 2,000 lb. Where no figures are reasonaments. For the content of t

United States Production of Synthetic Organic Chemicals

Chemical Acetaniid	March 1949 911,913	March 1948 190,955	February 1949 493,358	February 1948 582,961
Acetic and Synthetick Becovered. Natural Acetic anhydride Acetica Acetical Acetical	115,090,880 1,030,060 48,157,275 35,655,108 609,256	64,849,357 37,766,701 1,053,583 19,469,356	125,093,348 1,854,174 57,807,102	38,183,746 35,342,525 984,691 7,443,059

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Old brick, asphalt, etc. is reprocessed here, drops out of crusher directly into Brooks bodies—no re-handling necessary.



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Your plant too can experience a quick nose-dive in labor costs and equipment investment as in the following case. The City of Columbus had a problem—street repair crews waiting for repair materials with resulting lost man hours, high equipment costs and low production. Loading and hauling of brick, asphalt, crushed stone, etc., cost entirely too much. Solution:—6 Brooks Load Luggers and 18 detachable truck bodies. Now, materials are loaded directly into Brooks bodies, thus eliminating re-loading. Each loaded body is quickly hoisted and hauled away when and as needed. The chief engineer says, "We are doing a more efficient job with fewer trucks and far less expensive labor, and are saving the City of Columbus thousands of dollars." Man days are now reduced to man hours to the tune of an estimated 1152 hours per week.

HOW YOU CAN CUT YOUR MATERIALS HANDLING COSTS

Our competent engineers will make a comprehensive survey which might reveal costly delays in your plant. Send for our representative to determine how many man-hours you can save. No obligation, of course.

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Bu	ones.	T IIG	GER
TI	OAU	O P E R	ATED
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1. 6			

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CHEMICAL ENGINEERING-July 1949

COMMODITY, cont. from p. 315

vapor and losses due to uncondensed gases. In the opinion of many, trichloroethylene and tetrachloroethylene were to be preferred. The difficulty lay in minor decomposition at the elevated temperatures which resulted in corrosive products. In order to eliminate such difficulties, Du Pont developed a series of stabilizers which included caffeine, amylene, triethylamine and substituted phenols. It seemed, therefore, that this solvent had an economic future.

Accordingly, Du Pont acquired the Carrier process and made it available to Rex and Blakeslee. Beginning about 1934, application of trichloroethylene, especially in vapor equipment, was prosecuted with Du Pont the dominant supplier of the solvent. Growth was further stimulated during war years for the degreasing of military equipment of all kinds. To-day, the applications are almost "uni-versal." Detrex and Hooker Electrochemical Co. organized a mutually owned subsidiary, Hooker-Detrex, Inc. in 1946. This company plans to build a new plant at Ashtabula, Ohio, to be in operation early in 1950. This year the new plant of the Niagara Alkali Co. was completed at Niagara Falls while Diamond Alkali Co. is planning a unit at Houston.

U. S. Production of Synthetic Organic Chemicals, cont. from page 316

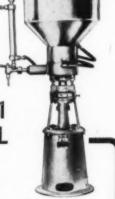
Chemical	March 1940	March 1948	February 1949	February 1948
Bartisturie acid derivatives *			** ***	
5-Ethyl-5-phenylbarbituric acid and salta (phenobarbital).	44,151	44,334	41,048	45,638
Between				
Motor grade;				
Tar distiller	*1*125*125	*********	**********	*********
Coke oven operators	1,654,678	833,928	713,645	886,768
All other grades:				
Tar distillers. Cohe oven operators	993,324	1,191,801	994,620	1,073,647
Coke oven operators	13,226,288	13,327,205	12,948,761	12,009,938
Butyl alcohol, primary, norma	8,995,367	10,619,183	11,165,957	9,900,117
Carbon bisulphide	81,832,327	38,374,288	31,911,353	30,733,296
Carbon tetrachloride	19,742,804	17,327,714	17,911,977	17,740,263
Chlorobensene, mono	28,501,511	28,115,483	23,172,007	26,210,077
Creasote oil:				
Tar distillers	11,543,542	8,630,008	11,507,500	8,909,830
Coke oven operators	2,317,385	3,548,942	1,927,618	3,115,502
Cresola, meta-para	433,667	903,960	897,312	710,969
Cresole, ortho-meta-para	578,920	686,410	554,980	635,658
Cresylic acid, refined ² , iii	2,493,121	2,287,484	1,650,710	1,617,458
Dibutyl phthalate	1,450,954	1,259,130	807,549	911,088
Dichlorodiphenyltrichloroethane (DDT)	3,568,457	2,002,480	3,060,978	2,224,776
Ethyl acetate (55 percent)	6,442,186	2274227242	3,653,222	5,711,863
Ethylene glycal	38,210,907	28,584,178	25,021,001	23,061,563
Ethyl ether	3,114,633	3,333,390	3,078,330	3,181,100
Formaldehyde, 37 percent by wt	42,701,099	00,105,226	43,589,463	\$1,927,967
Hexachlorocyclohexano	1,414,070	1,567,863	1,212,513	1,352,282
Methanol, naturall	1,339,416	1,352,601	1,141,520	1,312,635
Methanol, synthetis	93,330,851	60,829,318	84,880,153	72,665,317
Naphthalene:				
Tar distillers, less than 79° C.	11,014,810	19,381,642	13,616,163	17,960,905
Tar distillers, 79° C. and over. Coke-oven operators, less than 79° C.	6,321,866	8,356,000	7,199,771	8,290,687
Coke-oven operators, less than 79" C.	8,846,674	9,008,707	8,202,635	8,123,490
Penicillin and salus	9,662,418	7,432,286	9,763,388	7,057,264
Phenol	21,735,279	26,862,527	21,239,934	24,721,206
Phthalic anhydride	12,470,483	14,082,027	12,814,583	*********
Styrene, government and private plant	34,304,063	143,520	30,132,781	122,093
Toluene:		0 454 600	0.440.000	0.000.000
Coke-oven operators	2,631,331	2,436,277	2,445,530	2,304,578
All other	7,278,867	4,656,842	4,342,796	5,516,714
Xylene, crude	4,401,447	5,658,467	4,201,276	5,027,712

All data in pounds except bensene (gal.) creosote oil (gal.), toluene (gal.) xylene (gal.) and penicillin (million Oxford units). Statistics collected and compiled by U. S. Tariff Commission except where noted. Absence of data on production indicate either that returns were unavailable or confidential. Excludes the statistics on recovered acid. Acid produced by direct process from wood and from calcium acetates. Adl acetic anhydride including that from acetic by vapor-phase process. Product of distillers who use purchased coal tar only or from oil-gas or water-gas produced or purchased by tar distillers. Statistics are given in terms of bulk medicinals only. Statistics collected by Bureau of Mines. Total production including data reported hoth by coke-oven operators and by distillers of purchased coal tar. Reported to U. S. Bursau of the Census. Includes toluene produced from petroleum by any process.



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Now you can grind to a particle size of 1 to 1½ microns—instead of accepting the usual "under 5 microns" of the ordinary colloid mill. And the QV-7-1 assures a UNIFORM grind, because constant clearance is maintained, irrespective of temperature, by the lawar Shaft (zero coefficient of expansion). A more sanitury machine, easier to clean, is assured because the "flinger" at the bottom of the rotor prevents the finished product from "creeping" back. Manufacturers of penicillin, where fineness and purity are of paramount importance, are using the QV-7-1 Colloid Mill exclusively.



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Flake formaldehyde has no methanol or other inhibitor present, and contains no buffering salts. Its iron content and other impurities are held to formalin specifications. Paraformaldehyde can now replace formalin in many industrial applications to give definite economic and quality advantages.

PROPERTIES AND SPECIFICATIONS

APPEARANCE hard, pulverable flak
FORMALDEHYDE CONTENT (% BY WT. MIN.) 91.0%
ACIDITY (% BY WT. AS FORMIC, MAX.) 0.05%
ASH (% BY WT. MAX.)
IRON CONTENT (PARTS PER MILLION MAX.) 2
PARTICLE SIZE passes 1/2" screen
COLOR (APMA AS 37% SOLN)
BULK DENSITY (APPROX.) 0.65
MELTING POINT (SEALED TUBE) 100-125°C
FLASH POINT (TAG OPEN CUT APPROX.) 200
IGNITION TEMPERATURE (APPROX.) 575 F
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opens the way to new developments and improvements in the resin, rubb. r. extile and organic synthesis fields. This general purpose flake is a mixture of polymethylene glycols having an average degree of polymerization of ten oxymethylene groups. Its short polymer chain length indicates excellent reactivity. Its low water content (9% by wt. max.) minimizes water removal cycles and permits larger batches.

Flake formaldehyde does not dust. It promises easier handling and storage... no special facilities are required. It is available in 5, 25, 100 and 300 lb. Fiber Drums.

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New Construction

Proposed Work

- Ark., North Little Rock—Arkansas Farm Bureau Cooperative, c/o Ralph Hudson, Harrison. Ark., is having plans prepared by Utility Sales & Engineering Co., Atlanta, Ga., for the construction of a 150x300 ft. fertilizer plant here. Estimated cost \$600.000.
- Calif., Los Angeles—Western Waxed Paper Co., div., of Crown-Zellerbach Corp., 910 East 61st St., plans to construct a 400x450 ft. factory building and a 90x100 ft. office building. The Austin Co., 777 East Washington Blvd., Cons. Engr. Estimated cost \$350,000
- Del., Seaford—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, plans to construct a warehouse building here. Estimated cost \$100,000.
- III., Plainfield—Peoples Gas Light & Coke Co., 122 South Michigan Ave, Chicago, plans to construct a liquifying and storage depot for natural gases. Estimated cost \$6,000,000.
- Kan., Kansas City—Colgate-Palmolive-Peet Co., 105 Hudson St., Jersey City, N. J., plans to construct a 4 story plant here for the manufacture of toilet articles. Albert Kahn Associated, Architects & Engineers, Inc., New Center Bidg., Detroit, Mich., Archts. Estimated cost \$2,000,000.
- Ky., Louisville—Louisville Brick & Tile Co., 1328 South 2nd St., plans to construct a plant. Estimated cost \$100,000.
- Minn., St. Paul—Minnesota Mining & Manufacturing Co., 800 Farquier Ave., plans to construct a 2 story, 145x565 ft. factory on Reaney Ave. Estimated cost \$500,000.
- O., Ashtabula—Hooker-Dextrex, Inc., Niagara Falls, N. Y., has purchased a 25 acre site on State Rd. and plaus to construct a factory for the manufacture of "Trichlorethylene". Estimated cost \$1,500,000.
- Pa., Philadelphia—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, Del., plans to construct a research laboratory here. Estimated cost \$2,000,000.
- Pa., West Point—Sharpe & Dohme, Inc., Broad and Wallace Sts., Philadelphia, plans to construct a medical research laboratory. Estimated cost \$1,000,000.
- Tex., Abilene—Patton Oil Refinery plans to reconstruct portion of its plant here recently destroyed by fire. Estimated cost \$85,000.
- Tex., Freeport—Dow Chemical Co., Freeport, plans to rehabilitate its magnesium plant. Estimated cost \$212,000.
- Tex., Longview—Eastman Kodak Co., 343 State St., Rochester, N. Y., plans to construct a branch plant here to be used mainly for chemical manufacturing. Estimated cost \$1,000,000.
- Tex., Refugio—Bennett Oil & Refining Co., Refugio, plans to reconstruct its topping plant. Estimated cost \$100,000.
- Wis, Madioon—Rosster-Guano Co., Dempsey Rd., plans to construct a 1 story, 160x240 ft. addition to its storage building, also a 150x500 ft. loading platform. Estimated cost \$200,000.

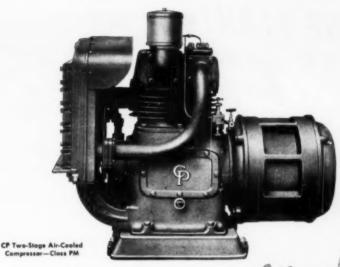
	Current I	rojects	Cumulat	ive 1949
	Proposed Work	Contracts	Proposed Work	Contracts
New England Middle Atlantic South Middle West West of Mississippi Far West Canada		500,000 750,000 302,000 7,770,000	\$274,000 161,583,000 9,051,000 19,354,000 40,940,000 4,475,000 30,505,000	\$1,260,000 6,840,000 24,519,000 29,668,000 48,388,000 3,768,000 56,402,000
Total	817, 137, 000	\$9,454,000	\$266, 182,000	\$170,855,000

- Alta., Calgary—Gypsum Lime & Alabastine Canada, Ltd., 30th Ave. and 17th St., E., plans to construct a rock wool insulation plant. Estimated cost \$300,000.
- Man., Winnipeg—Gypsum Lime & Alabastine Canada, Ltd., 7 St. James St., plans to construct an addition to its factory here. Estimated cost \$500,000.
- N. S., Brookfield—Martime Barvtes, Ltd., Brookfield, plans to construct a plant. Estimated cost \$200,000.
- Out., Etobicoke—Faberge Parfumes Canada, Ltd., 690 King St., W., Toronto, plans to construct a processing plant, office and showroom. Estimated cost \$90,000.
- Ont., Leaside—(Toronto P. O.)—Panther Oil & Grease, Ltd., 840 North Main St., Fort Worth, Tex., U.S.A., plans to construct a plant for the manufacture of asbestos and asphalt roofing compounds. Estimated cost \$100,000.

Contracts Awarded

- Fla. Palarka—The Hudson Pulp & Paper Corp., Pa'atka, will construct a werehouse at its plant here. Work will be done by owners. Estimated cost \$500,000.
- Chicago—E'cetro Products Laboratories.
 North Ravenswood Ave., has awarded the contract for a factory to Louis Cohen 3751 West Dickens St. Estimated cost 868,000.
- III., Chicago—E. I. du Pont de Nemours & Co., Inc., du Pont Blde., Wilmineton, Del., has awarded the contract for an addition to its paint factors to G. P. Cullen & Co., 2940 West Lake St. Estimated cost \$76,000.
- 10. Chicaeo—Northwestern Platine Works. 2031 Oeden Ave. has awarded the contract for a 1 story plating factory to Joseph Skorepa, 3536 Wesley Ave. Berwen, Ill. Estimated cost \$90,000.
- Ia. Des Moines—Iowa Plant Food Mountaturine Co., 300 Farm Bureau Bide. has awarded the contract for the design and construction of a fertilizer factory to Iolin 1 Harte Co. Foreth Bidg. Atlanta. Ga. Extimated cost \$1,000,000.
- Miss. Jackson—Mississinni Federated Cooneratives, 2003 South State St., has awarded the contract for the design and construction of a supermhosphate manufacturing plant to John I. Harte Co., Forwith Bldg., Mlanta, Ga. Estimated cost \$250,000.

- N. J., Linden—Great Lakes Carbon Corp., 18 East 48th St., New York, N. Y., has awarded the contract for the construction of a permalite plant on a three acre site here to Blaw Knox Construction Co. (Chemical Plants Div.), Farmers Bank Bldg., Pittsburgh, Pa.
- Tex., Freeport—Dow Chemical Co., Freeport, has awarded the contract for an industrial building to Tellepson Construction Co., 3900 Clav St., Houston. Estimated cost \$1,000,000.
- Tex., Jourdantown—Humble Oil & Refining Co., Humble Bldg., Houston, has awarded the contract for a tank and truck loading racks to Hudson Engineering Corp., 2711 Danville St., Houston. Estimated cost \$110,000.
- Tex., San Diego—Coast Oil Corp., San Diego, will construct a gasoline refinery with own forces. Estimated cost \$800,000.
- Tex., Seeligson (Alice P. O.)—Humble Oil & Refining Co., 1216 Main St., Houston, will construct a gas injection plant with own forces. Estimated cost \$975,000.
- Tex. Sherman—Lone Star Gas Co., 1915 Wood St., Dallas, will construct a compressor unit with own forces. Estimated cost \$110.000.
- Tex., Spearman—Phillips Petroleum Co., Bartlewille, Okla., will construct a booster station on its gas pipe line. Work will be done with own forces. Estimated cost \$400.000.
- Tex. Stimett—Stacy Dresser Engineering Div. of Dresser Interests, Cleveland, O., will construct a desulfo plant here. Work will be done with own forces. Estimated cost \$375,000.
- Wis., Oshkosh—Hoffmaster Paper Ca., Oshkosh, has awarded the contract for a 1 vorv, 100s/100 ft. warehouse to Ben B. Ganther Co., 78 State St., Oshkosh.
- Wvo., Worland—Texas Gulf Sulphur Co., United States Natl. Bank Bidg., Galveston, Tex., has awarded the contract for the design and construction of a gas treating obust and sulphur recovery plant to The Girdler Corp. 224 East Broadway, Louisville, Ks. Estimated cost \$3,000,000.
- Ore., Montreal—Dominion Glass Co. Ltd., 23°5 Wellington St., has awarded the contract for a 1 story, 104s425 ft. addition to its plant to Amelin Norcross/Quebec. Ltd., 892 Sherbrooke St. Estimated cost \$132,000.



compressed air Mywhere

- without waste



CP Twe-Stage Air-Cooled Compressor—Class PB

In many large and medium sized plants air is needed in isolated locations. These small, compact CP compressors may be installed independently of the main air system, dispensing with long air lines. They are also ideal for off hour operations.

In smaller plants, the entire air requirements may be met most economically with these small, efficient compressors.

Built to the same high standards as the large CP compressors, Class PM two-stage air-cooled compressors are available in sizes from 139 to 445 c.f.m. piston displacement, with built in motor (as illustrated) and with flexible coupling or V-belt drive.

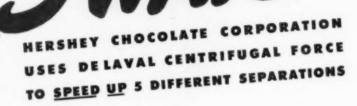
Class PB-20 Compressors are available in three sizes: 7½, 10 and 15 HP, with piston displacement ranging from 39 to 82 c.f.m. Illustrated is the tank-mounted type.

Write for complete information.



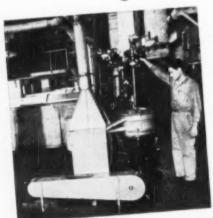
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

HOWONE PLANTPUT ME
TO WORK 5 WAYS



"I am De Laval Centrifugal Force. I speed up many operations in chemical process and food plants by making the separation or clarification continuous. One plant where the engineers really put me to work is that of the Hershey Chocolate Corporation—I do 5 different jobs:

PREMOVE ALMOND DUST FROM NUT OIL 2 DEHYDRATE INSULATING OIL 3 CLARIFY ALL MILK ENTERING PLANT 4 MAINTAIN LUBRICATING OIL EFFICIENCY 5 REMOVE DIRT & WATER FROM TURBINE OIL



Two Clarifiers (newer one is hidden) keep nut oil free from almond dust

Hershey is a good example of how a plant can use centrifugal force in many ways. Obviously, the needs vary according to the product manufactured: some processes call for a small Clarifier, some for a De Laval "Nozzle-Matic" with its 6,000 gallons an hour or more capacity. De Laval has the proper machine for each continuous separation requirement.

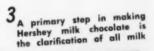
The complete story of how De Laval centrifugals are used at Hershey Chocolate Corporation is given in the De Laval Centrifugal. Review for January, 1949.

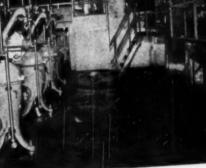
· Write for your free copy.

CAN De Laval SERVE YOU?

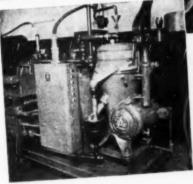


2 Purifying insulating oil from one of "Chocolate Town's" 88 transformers





4 Both compresser oil and miscellaneous oils are purified



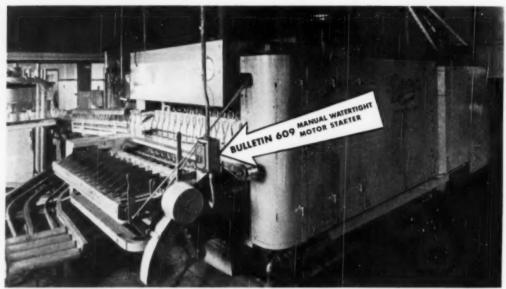
5 A real old-time De Laval, still giving good service on turbine oil



THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
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CENTRIFUGAL MACHINES
FOR PROCESSING SYSTEMS



Allen-Bradley Bulletin 609 Manual Watertight Starter dn a Mayer Dumore Junior Battle Cleanor installed in a Milwaukee dairy.

TROUBLE FREE Manual Starters for Dairy Equipment



BULLETIN 609 MANUAL MOTOR STARTER in general purpose enclosure. Enrichie reputation for refioble operation. Bright white inferior makes witing eath.

WATERTIGHT ENCLOSURE Nema Type 4. Watertight and weather proof. Cast iron enclosure. Bubber gasketseal. A-8 double break, silver alloy contacts need no maintenance.



Where wet operating conditions exist, as on a bottle cleaner, a dependable starter is a must. That's why Allen-Bradley Starters are used wherever reliable, trouble free, long lasting starters are a prime requisite.

Bulletin 609 Manual Motor Starter is compact. Silver alloy contacts are closed and opened manually with two buttons—START and STOP—which actuale the switch with a quick make, quick break action. Overload breakers protect the motor. In wet, moist surroundings, Allen-Bradley Starters in watertight enclosures give necessary protection to vital starter elements.

Allen-Bradley has a safe enclosure for every kind of job . . . wet, hazardous, dusty, corrosive. We will be glad to recommend the correct standard starter and enclosure for your motor control applications.

Allen-Bradley Co.

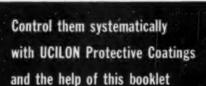
1337 S. First St. Milwaukee 4, Wis.





Are your CORROSION troubles

listed here?

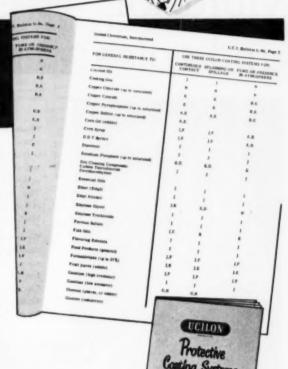


Users of Ucilon coatings are acclaiming this systematic method for controlling corrosion as they report getting longer life from equipment plus lower maintenance costs. It may be the practical answer to your

First, we send you this 32-page booklet. It lists common agents responsible for failures of ordinary paints and the subsequent corrosion of equipment. For each of the 153 agents listed, it presents a recommended system of Ucilon protective coatings for use against the specific trouble - one which has proved it can lick the corrosion problem to a "standstill." There are systems that resist acids, alkalies, salts, oils, water, organic materials.

You choose the best system for your application, and by so doing you automatically select the required coatings from the complete Ucilon line. Then follow the complete instructions for carrying out the system.

See what a big difference such a systematic approach to corrosion control can make in your plant. You'll learn why Ucilon Systems succeed so often where other coatings fail.





A CHEMICAL PROCESSOR, for example, coated a steel storage tank with a Ucilon coating system. Especially hard on protective coatings, the tank's contents had broken down two other coatings tried-one in 6 weeks. Yet Ucilon was still in good condition after 14 months!

Take advantage of modern, engineered surface protection. Send for your copy of this booklet.

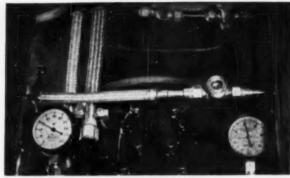
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American Vibration Eliminators prevent transmission of wibration through the piping from the compressor of this alternating heating and coaling unit.

Whatever your piping problem, whether it's vibration, misalignment, connecting moving parts or making connections in cramped spaces, there's a type and size of American Seamless Flexible Metal Tubing or American Strip-Wound Flexible Metal Hose to meet it. They include designs for carrying almost every type of fluid, gas, semisolid and steam.

Heat, pressure and corrosion are no problems.

We would like to send you descriptive literature showing how American Flexible Metal Hose and Tubing are doing the job better in many plants and on many kinds of equipment. Simply address The American Brass Company, American Metal Hose Branch, Waterbury 88, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.

wherever connections must move

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4 + 8 works here at the Barberton Plant of Pittsburgh Plate Glass Company, Columbia Chemical Division P.17







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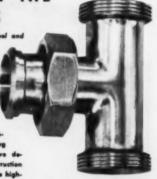
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When it comes to expert welding and fabricating of complex assemblies, you just can't beat the speed and accuracy offered with TRI-CLOVER'S exclusive Heli-Arc Atomic Hydrogen Welding . . . a specialized semi-automatic process that assures highest quality and FULL corrosion resistance. Shown here are a few typical examples of the wide variety of jobs we handle every day.





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PLASTICIZERS

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(Dicyclohexyl Phthalate)

Color White

Form Granules
Odor Moderate aromatic
Acidity (as Phthalic Acid), % . . 0.10 Maximum

Saponification Number 335-345
Melting Point, °C. 62-65

Containers Fibre drums containing approximately 230 pounds net.

"ELASTEX

10-P PLASTICIZER

(Diisooctyl Phthalate)

Color Clear, 100 Hazen Maximum

Form Liquid

Saponification Number 280-290
Cloud test for water Clear at 0° C.

Containers 50-55 gal. non-returnable steel barrels.

BARRETT ELASTEX

50-B PLASTICIZER Color Clear, practically water-white (50 Hazen maximum)

Form Liquid
Odor Mild Ester
Distillation at 5 mm. Hg, °C. 189-222
Specific Gravity, 25/25°C. 1.076

Pounds per Gallon at 25°C. 8.95
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July 1949—CHEMICAL ENGINEERING

COPPER ALLOY BULLETIN

CONDENSER AND HEAT EXCHANGER TUBING EDITION

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER BASE ALLOYS

Prepared Each Month by BRIDGEFORT BRASS COMPANY Bridgeport



Headquarters for BRASS, BRONZE and COPPER

Finned Tubing Finds Wider Applications

Improved Heat Transfer Properties Give Greater Economy

Serrated strips, helically wound and soldered or welded to tubes, greatly increase the surface area and thus the heat transfer effectiveness of each foot of tube length. Illustrated is a typical Tilco-Fin Tube, made by David E. Kennedy, Inc., Brooklyn, New York, with Bridgeport copper tubing and copper strip in its fabrication. Excellent corrosion resistance and high thermal conductivity assure good heat transfer properties.

The higher heat transfer properties of finned tubing compared to regular tubing allows for a smaller and more compact coil

Tilco-Fin Tubing Made of Bridgeport copper and copper-base alloys.

Courtesy David E. Kennedy, Inc., Brooklyn, N. Y.

design, more economical heat exchanger surface, smaller ducts, higher air speeds, and greater over-all equipment economy.

Petroleum Refinery Applications All refinery materials such as crude oil, gasoline, naphtha, fuel oil, gas oil, lube oil and reduced crude may be either heated or cooled in a finned tube of a suitable material fabricated by a method suitable to the temperature and pressure of the operation involved. Cooling is carried out in air-cooled heat exchangers by blowing air by means of forced draft over the finned surfaces. Such units are becoming increasingly important in many areas due to short water supply. Heating may be carried out by passing hot flue gases over the finned surface. Considerable "waste heat" may be utilized economically by employing finned tubing.

A very important use of air-cooled heat exchangers is for cooling the jacket water of Diesel engines in power stations, pipe line pumping stations, gas pipe line pumping stations in desert or any water shortage areas. The oil fields now being opened in the Middle East will require considerable amounts of finned tubing for pipe line and power services. Chemical Processing Applications. The chemical and process industries use finned tubes in drying operations for steam heated ovens, and tunnel driers. It permits compact design, easily controlled equipment temperature, and very economical operation because of high efficiency of the funct surface and low operating temperatures of the coils.

Another class of heat exchange problems for which finned tubes provide an answer involve liquids which have poor heat transfer properties. The heating or cooling of vegetable oils is a good example.

Other Applications. Most any gas or vapor heating or cooling operation can be economically handled on a finned surface. An important use of finned tubes is for hydrogen or air coolers used on turbine generators. For space heaters copper tubes with copper fins have been applied successfully for some time. There are also a few cases where Cupro Nickel tubes and welded steel fins and Cupro Nickel tubes with solder bonded copper fins have been used. The same fin material as the outside surface of the tubing is advocated if welding is required. For solder bonded fins dissimilar metals may be used. For example, a high pressure tube may require steel for strength, a brass liner for corrosion resistance and solder bonded copper fins for high thermal conductivity.

Finned Duplex Tubing Available. For improved heat transfer properties, fins can also be applied to the exterior of Duplex Tubing for handling two entirely different types of corrosion media present on both the inside and outside of the tubing but cannot be handled satisfactorily with a single metal. Combinations, such as Cupro Nickel, Admiralty, Duronze *IV (Aluminum Bronze), Silicon Bronze, Copper, Muntz Metal can be made with steel, stainless, aluminum or monel either inside or outside to handle corrosive fluids or gases such as hot oil, ammonia, and a variety of acid or alkali solutions.

Corrosion Resisting Alloys. A wide variety of materials of construction are available capable of handling practically all liquids and gases no matter how corrosive. For making finned tubing Bridgeport condenser tube alloys, such as Copper, Admiralty, Aluminum Brass, Muntz, Aluminum Bronze, Silicon Bronze and Cupro Nickel are available.

*Reg. U. S. Pat. Cff. 2093380

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ESTABLISHED 1844

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In addition to their chemical and thermal resistance features, these fibers have excellent tensile strength and abrasion resistance. They offer low moisture absorption and are not harmed by molds or fungi.

We have been weaving filter cloth for more than forty years and have pioneered in the weaving of synthetic fibers into industrial filter media. These years of weaving industrial filter fabrics have furnished us the background and the "know how" necessary to produce synthetic filter media having superior filtering characteristics.

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July 1949 CHEMICAL ENGINEERING

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FOR HANCOCK—and only Hancock provides, as standard, these twelve important and dollar-saving features in steel gate valve construction:

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- 8. Packing Ease.
- 9. Ball Bearing Stem-To-Wedge Connection.
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- 11. Interchangeable Parts.
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HANCOCK Steel Gate WELDVALVES are general purpose valves and designed for 800# at 750° F. or 2000# at 100° F. Size ½" thru 2".

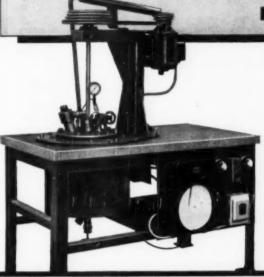
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This \$60,000,000 Government plant, built for war-time production of chemical warfare materials and munitions, consists of 20,000 acres and 350 buildings with over 3,000,000 sq. ft. floor area, machinery and equipment. A large portion of this plant, including the liquid chlorine and caustic manufacturing facilities, is now being operated through leasehold interests.

Expansion and conversion potential includes manufacture and storage of chemicals, textiles, food products and frozen foods, plastics, ceramics, confections, furniture, metal and wood products, synthetic derivatives of sulphur monochloride and ethylene, insecticides

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Location ideal. Prime markets. Complete transportation facilities. Navigable access to Mississippi River. Low cost water and power supply. Choice industrial sites. Adequate housing. Rich farm and grazing lands

This plant constitutes a part of the Na-tional Industrial Reserve and has been designated for disposal subject to the National Security Clause.

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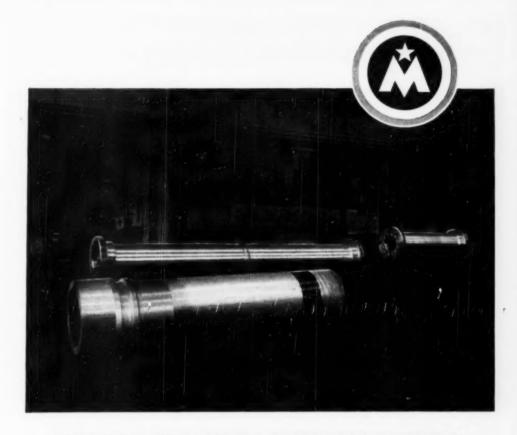
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This Where To Buy Section supplements other advertising in this issue with additional announce-ments of products and materials of special interest and application in this field. Make a habits of checking this page each issue

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Extreme conditions of temperature, pressure and corrosion are best met by one-piece construction of *stainless steel*. Vessels such as these, built for a large chemical corporation, are homogeneous throughout. There are no welds to introduce complications. Midvale precision-machined the heads from solid forgings. Inspection confirmed perfect fits in each case. The Midvale Company, Nicetown, Philadelphia.

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- 1-Sperry 42" aluminum Filterpress, same as above, but 17 chamber.
- 4—5000 gallon stainless steel vertical Tanks with dished heads 10'x7'9", with 18" man-
- 2-1600 gallon vertical steel Pressure Tanks, 66"x128", good for vacuum with dished hamfs.
- 4—1600 gallon tanks, same as above BUT jacketed and insulated.
- 2—Vertical steel Tanks, 8500 gallon, interior zinc coated; 10'x15' dished heads, 20" man-hole, heavy duty pressure type.
- -Horizontal steel Tanks, 6500 gallon, 18'x14', dished heads, 18" manhole.
- Model A4A automatic Elec-Tri-Pak weigher with Model 30, 15' conveyer; used to fill exactly 500 grams into bottle, 8.5. contact puris.
- 1—Resina automatic Bottle Capper, LC 444 stainless contact parts, extra long intake and discharge conveyor, motorised A.C.
- Productive Equip. Co. Selectro Vibrator, fully enclosed, 2'x2' with 3 HP Expl. proof motor, plain steel construction.
- 3—Colton rotary Tablet Machines, Model 9-18
 BC/2. Max. tablets 2"x234", speed 235 per min., p.d.
- Lightnin' Mixers by Mixing Equip. Co., Model 330,300, 3 RP Cless 2, Group 9, 3/40/440 V. AC motors with steel shafts, 11° long, having two 15" steel props.
- 1—Lightnin' Mixer (side entering), with stuffing box: 20 HP, with Fulk reduction unit, to BPM 421, chrome plated shaft, 3"x24", 3 binded prop., 24" dia.

SYRUPS - FLAVORS

- 4—Piaudler 5400 gal. Glass Lined Storage Tanks: 10" x 11", perfect condition with Tanks: 10' x 11', perfect condition with side entering agitators; closed manhole
- tops.

 Vertical Steel Storage Tank, 22,000
 qal. 18½ x 13°; welded construction,
 manhole top, ladder included.

 2—Morix Rotary Stainless Steel Gravity
 Vacuum Fillers. capacity from pints
 to gallons: Resina Automatic Capper;
 Elgia Rotary Can Closer; Eyler Can
 Caser.
- Standard Knapp Aut. Gluer and Sealer for
- Miscellaneous: Pumps. Hoists and Fac-tory Handling Equipment.

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- 5—Steel Fusion Pots 4' x 1' with anchor type agitators and direct fired oil burners.
- 2—Steel Sulphonators, manhole type with jackets for oil, and agitators, sizes 7' \times 7'8" and 3' \times 2'.
- 1—Stainless Steel Still, direct oil fired; dished top and bottom; \$1" x 58", complete with vacuum receiver and condensing tank.
- 2—Rectangular Steel Settling Tanks; 54" x 15' x 30" and 56" x 72" x 30".
- 2-Agitated Vertical Tanks 5000 gal.
- 1-Ingersoll Rand Compressor 5" x 3" x 312" with 5 H. P. motor.
- 1-La Bour Stainless Steel Centrifugal Pump with 5 H.P. motor.

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4-Bodger Copper Columns 72", 30".

3-Buffalo Rotary Vacuum Dryers, 5' x -Tolhurst 40" Suspended Centrifugal, monel basket, motor driven.

-Tolhurst 48" Center Slung Centrif-ugal, S.S. basket, motor driven.

- 14—2 Truck Atmospheric Steam Heated Dryers, 500 sq. ft. drying surface each. 1—Devine 3'x14' stainless clad Retary.
- 2-Bonnet S'x40', 3'x45' Retary Dryers. 2-Ruggles-Coles Dryers 78"x35", 4'x20"
- 2—Vacuum Shelf Dryorn with 13—58"x78" and 28—42"x42" shelves.
- 2—Bullovak 32" x 100" x 72", Atmos-pheric Double Drum Dryors with acrow CORVEYORS.
- 5-Louisville Steam Tube Rotary Dryers 8'x25', 8'x58'.
- 1-P&S Aprion Dryer, 45'.
- 1-Spray Dryor, Stainless Steel, 6' dia.

PULVERIZERS-MILLS

- -Abbee 6'x8', 5'x4' percelain lined, Jacketed Pebble Mills, motor driven
- 1-Patterson 3'x4' steel jack't Ball Mill.
- 2'n3', 3'n3', 3'n4', 4'n3', 5'n6', 8'n9', 3-Mikro Fulveriners 18H, 2TH, ZDH.
- 1-Porter Multiple for Mill, 4-1 gal, jars. -Fitzpatrick Type "D" Comminuter S.S.
- 2-Hardings 3'x24", 6'x22" Conical Mills. 4-Raymond 210 and 250 Imp Mills.
- 3-Raymond 20 and 200 Screen Mills.
- 1—"Jay Bee" Hammer Mill size 2UX. 1—Jeffroy 24"x30" Type "A", 50 HP motor. 2—Tyler Hummer 3'x3', 4'x3' Screens.

-Bird Continuous Centrifuges 18" x 28" monel, 36" x 34" steel. -Baker Perkins 100 gal. Double Arm Jacketed Mixer.

1-Stokes DDS2 Tablet Press

- FILTERS Einco 4' x 8' S.5. Rotary Voc. Dryer.

 Sweetland 27. 8 Filter with 54 leaves.

 Sweetland 27. 27 leaves.

 Sweetland 27. 27 leaves.

 Sweetland 27. 27 leaves.

 Sweetland 25. stainless, 26 leaves.

 Sweetland 25. tainless, 26 leaves.

 Sweetland 27. 17 leaves.

 Shriver 18'' Aluminum Filter Press.

 Shriver 18'' P6F cast iven.

 Sperry 26'' 18'' cast iven.

 Sperry 18'' 18'' cast iven.

 Sperry Skeletons 42'' to 18''.

 Shriver, Sperry Skeletons 42'' to 18''.

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 -36" Sections of Swenson Wolker Centinuous jucketed Crystellisers.

 -Struthers-Wells 500 and 400 qul. clessed,
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 -Dopp 250, 150 qul. sleam jucketed,
 agitated Kettles, high pressure.

 -Floudier 75, 130 qul. plans-lined,
 ateam jucketed, agitated Kettles,
 1-Ploudiers 1900 qul. qitan-lined, juck15—Stanless Steel Kettles, 50 to 500 qul.

MIXERS-SCREENS

- MIXERS—SCREENS

 2—Botar 252 Double Deck 49"x120"

 1—Day Ro-Bull 2 Deck 20"x120"

 1—Day Ro-Bull 2 Deck 20"x120"

 1—Day Ro-Bull 2 Deck 20"x120"

 2—Botar 252 Double Deck 49"x120"

 4—Roker Perkins Stainless Lab. Deuble Arm Mixers, I and 2 qul.

 1—Readeo stainless 4 qul. Mixer.

 2—Baker Perkins 50 qul. sigme bludes.

 1—Buker Perkins 100 qul. stainless clod. jacksted double arm Mixer.

 2—Baker Perkins 4½ qul. jacksted. jacksted. double arm Mixer.

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2-4' x 5' silex lined 4' x 5'
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- 4-lng. Rand 36"x36"x14" Dry Vacuum Pumps Type XRE-1, motor driven. 2-Worthite Centrifugal Pumpe 500 gpm.
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Scales, etc. Send for Complete List.



The Gelb Girl, July 1949

- 1—Pfaudler aluminum jacketed reactor, 1,300 gallons. (New)
 1—Pfaudler 250 gallon aluminum jacketed reactor. (New)
- -rounder 200 gains disminum jockerea reactor. (New)
 Plate Fabricators jacketed Kettle, 900 gallons 125 psi in jacket.
 -Kovin 200 gallon jacketed Kettle 75 PSJ, anchor type agitator.
 -Rubber lined storage tanks, 7,800 gallons.
 -Cast iron Jacketed Kettle with agitator, 600 gallons.

- -2,200 gallon Jacketed Kettle with agitator.
- -Stainless Steel Jacketed Kettle, 220 gallons. -Blaw Knox Jacketed Agitated Autoclave 3' x 4'2'

- 1—blaw Anox Jackered Agricated Autocures 3 x 42.

 —Black & Clawson double drum Dryers 28" x 60".

 4—Louisville Rotary Steam Tube Dryers, 6' x 50', 54" x 30'.

 2.—Buffalo Double Door Vacuum Shelf Dryers, 12 and 15 shelves.

 1.—Buffalo Single Door Vacuum Shell Dryer, 17 shelves.
- Bartlett & Snow Direct Heat Dryer, Brick lined 81/2' x 50'.
- -Buffalo Drum Dryers, 5' x 12'. -Buffavak Double Door Dryer 32'' x 90'' Chrome Plated Drums.
- Stokes Vacuum Dryer 4' x 10'
- Stainless Steel Hersey Rotary Dryers, 30" x 16', 36" x 16'.

 –B & S Double Drum Atmospheric Dryer, 3' x 6'.
- Shriver Plate & Frame Filter Press. 7
- 1—Vallez Lab. Filter #2E. 1—Shriver 42" x 42" Filter Press Skelton.
- Sweetland Filters #12.
- -Sweetand Pitters # 12. -Stainless Steel Storage Tank, Closed, 300 gallons. -Monel Storage Tanks, 1,800 gallons. -10,000 gallon storage tank 1" shell.

- -10,000 gation stronge tains, 1 sheet. -Stainless Steel Storage Tank, 4' x 5'. -Stainless Steel Storage Tank, 6,000 gallons. -Stainless Steel Vertical Storage Tank 10' die. 20' high. -Nickel lined Jacketed Kettle, 4,000 gallons.
- 1-Pfaudler Glass lined Kettle, 220 galle

- Nickel Jacketed Stills, 48" x 58"
- Bird Suspended Stainless Steel Centrifuge, 40" perforated basket with motor.
- -Shriver 42" x 42" Filter Press, with hydraulic closing, 46 chambers.
- Shriver 36" x 36" Cast Iron Plate & Frame Filter Press, Closed delivery.
- Shriver 18" x 18" Bronze Filter Press.
- 1-Sweetland #5 Filter, Stainless Steel Clad.
- -Oliver Rotary Filter 8' x 12', 8' x 10'
- 1-W & P Jacketed Mixer, 500-gals.
- –Jacketed Kettles, 1100 gallons, 5½' x 5½'. -Abbe Buhrstone lined Pebble Mill, 6' x 12', with Motor. -Kent Jacketed Powder Mixer, 800 lbs. capacity.
- J. H. Day Powder Mixers, 800 lb. capacity.

- Ross Pony Mixers, 45 gallons. Ross Powder Mixer, 2,000 lbs. -Simpson #0 Intensive Mixers, (New).
- Paterson Parax-lined Pebble Mill, 48" x 24". -Allis Chalmers Ball Mill 5'8" O.D. x 18'; Silex lined. -Hardinge Conical Ball Mills, 8' x 30", 5' x 24", 6' x 22".
- Farrell 2-roll Rubber Mill, 16" x 36"
- Royle Extruders #1 and #2.
- Ball & Jewell Rotary Cutter # 1/2 with 5 HP Motor
- -Tolhurst Center-slung rubber lined Centrifuge, 30" basket. -Tolhurst 20" rubber lined centrifuge

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10—Fortuble ¼ RP to 1 HP, 400, 1725 RPM
10—Portuble ¼ RP to 1 HP, 400, 1725 RPM
10—bouble Arm Bids. heavy duty: 8-P 15
gai. Vac. Day 25 gai. W&P 100 gai.
Reod 256 gai.
1—Day 170 gai. Hariz. Spiral. Jkid.
7—Thor Type lead & paste. 60 gai.

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—Tray Dryer—1630 eq. ft.
—Pun Dryer—5" x 30" x 38"

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—Rotary, Hot Air, 4" x 12", 6" x 23"

—Rotary, Vacuum, 30" x 6", 7" 6" x 20"

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1—Triple Effect, steel tube. 5000 sq. ft.
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1—Copper Var. Pm. 6* die. x. 16* H. jktd.
88 sq. ft. coil. condensor
2—Copper Var. Reviles, jktd. cqtt. 180 qctl.

30—Stainless and Socialess Clad, 40,2 & 100,2 lit. open top, 20 qud. to 500 qud. —Dopp Cast iron Ritd & Aqit, 200 qud. —Steel, Ritd, closed, 130 qul. & 350 qud. & Auminum, Ritd, aqit, closed, 100 qui. & 100 qui.

6 1000 gal. Atuminum, closed, colls. 175 gal. Copper, jktd, agit, closed, 100 gal.

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Swenson Precent Botary Varuum, 8' x 8' acid proof, lead 6 rubber Botary Varuum 8' x 3', Siesl Swestland #10, C.I. body, 53 bronze leaves, 500 sq. ft. loaves, 500 sq. ft.
Sperry skelenn for 30"
Shriver PAF Wood, 30", 25 sh., open
Shriver PAF Wood, 30", 25 sh., open dely.
Shriver PAF C.I. 25", 54 ch., open dely.
Shriver PAF Wood, 12", 12 sh., cl. ely.
Showser PAF Wood, 12", 12 sh., cl. ely.
Bowner PAF Iran, 12", 18 ch., open dely.
Shugher Pates, Leaf, 25, 21
Shughe Pates, 6" to 30" dia.

MILLS

I—Allis Chaimers Cant. Ball. 8' z 7', steel
inner, 250 HP motor, 2'', 2'', 4'' balls
2—Abbe Pabble zGPH. 6' dia. z 6' L
1—Abbe Double Jar Mill
3—Byrout Waldren Attrition 18'', 39''
1—Robinson Double Attrition 22''
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3—Millare Palveriares 24', 21', Bentum
2—Colloid Mills, 6'', Steinless

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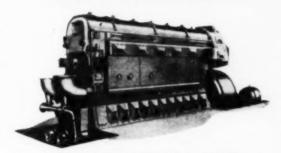
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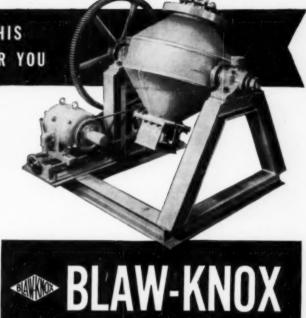
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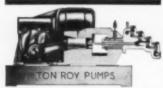
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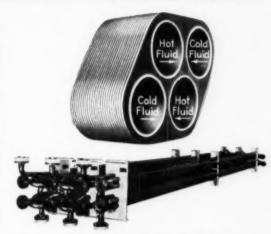


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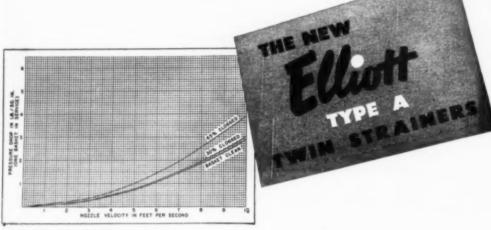
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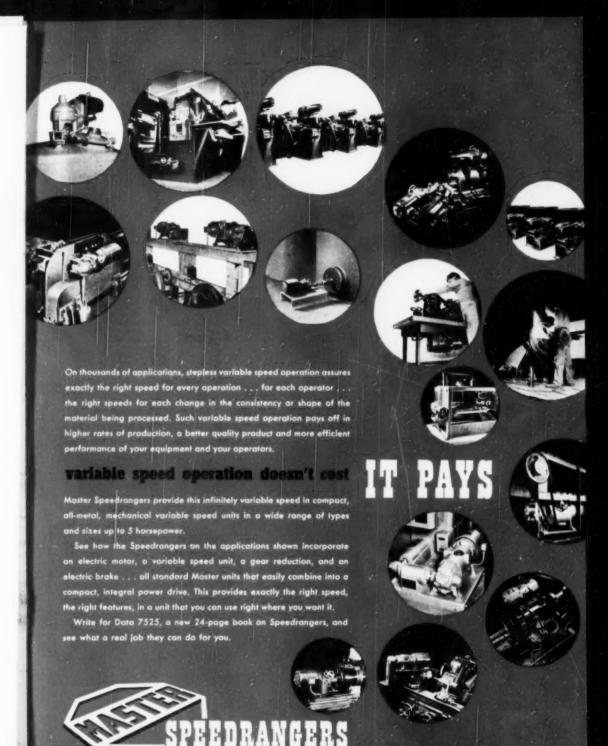
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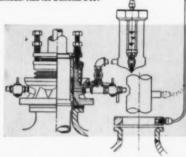


THE MASTER ELECTRIC COMPANY - DAYTON 1, OHIO



PFAUDLER GLASS-LINED PUMP Designed for services beyond the chemical resistance offered by alloys; suitable for temperature and pressure conditions outside the range of other types of linings; facilitates the handling of materials which do not adhere to glass but do adhere to metal; combines high acid resistance with mechanical ruggedness.

The Plaudier Pump operates in a vertical position to allow separation of liquid pumped from the stuffing box. It is designed for low speed operation and will handle from 30 to 240 GPM. Equipped with stuffing box for severe chemical service with a patented gas barrier between liquid pumped and the stuffing box. This feature makes the Plaudler Pump practical for most severe service conditions. Ask for Bulletin 847.



PFAUDLER DEVELOPMENTS

TO CHECK CORROSION AND IMPROVE OPERATING PERFORMANCEL

Here are five new Plaudier developments which increase the service life and improve operating control of glass-kned equipment used for highly seive services. Complete details on request

AUTOMATIC COUNTERBALANCE LUBRICA-

TION SYSTEM Plaudler Stuffing Boxes must withstand the most severe chemical corrosive conditions. Automatic counterbalance keeps the Stuffing Box flooded with lubricant under slightly higher pressure than the reactor, which excludes all corrosive vapors. Several methods depending on the operating conditions are available. Also, see "Tellon" Packings and ask for Bulletin.

PFAUDLER "TEFLON" PACKING

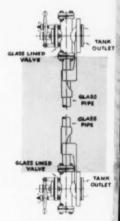
Pfaudler has developed tough porous "Teflon" packing rings without any binding material. These provide complete chemical resistance and are recommended only for the bottom rings of the stuffing box where they act as an effective stop for the standard packing. Combined with automatic lubrication this frees the stuffing box from most maintenance problems.

PFAUDLER MULTIPLE INLET AND SIGHT BOX ASSEMBLY This glass-lined inlet assembly increases the flexibility of any Pfaudler reactor, old or new. It is made for 2", 3" and 4" ASME flanged openings and can be assembled to take a maximum of four inlet lines as shown. The sight box permits visual observation of rate of flow and prevents leakage of valves. All inlet paths are completely drained without possibility of trapped liquid. Details on request.



PFAUDLER GAUGE GLASS

ASSEMBLY This assembly is a metal free gauge glass for highly corrosive acid conditions. Special Pfaudler glass-lined fittings include quick acting porcelain shut-off valves and standard 1" glass tubing with "Teflon" packings.



FOR COMPLETE INFORMATION ON ANY ONE OR ALL OF THESE ITEMS USE CONVENIENT FORM.

Pfaudler

THE PFAUDLER CO., ROCHESTER 3, N.Y.

ENGINEERS AND FABRICATORS OF CORROSION RESISTANT PROCESS EQUIPMENT Glass-Lined Steel . . . Stainless Steels . . . Nickel . . . Inconel . . . Manel Metal

THE PFAUDLER CO., Dept. CE 7, Rochester 3, 1	N. 1	Y	
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Please send me information checked.

B47: Counterbalance Lubrication System: Plaudier Telion Pecking Rings.

Plaudier Injet Assembly;

Plaudier Rings.

Plaudier Rings.

HAHE COMPANY ADDRESS. ZONE

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